Revealed: Fastest Wireless Networks in the U.S. p. 61

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# FAST PC FIXES

## 26 Quick Tips!

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# August

Volume 31 | Number 8
pcworld.com

FEATURES

48 **Fix It Fast!**
Whether your tech problem involves hardware, software, a network, the Internet, or a mobile device, our trouble-shooting guide will help you diagnose and correct it quickly.

61 **America's Fastest Wireless Networks**
This year's study of 3G and 4G wireless speeds took us to 20 cities across the United States. Find out how AT&T, Sprint, T-Mobile, and Verizon fared in our exhaustive, real-world tests.

77 **Here Comes Haswell!**
Get the complete scoop on Intel's fourth-generation Core-series CPUs. We evaluate the specs and performance of these new chips, and review the first machines that sport them.

COMMUNITY

7 **Editor's Desk**

9 **Forum**

96 **Five Things**

# August

Volume 31 Number 8
pcworld.com

## DEPARTMENTS


## 13 Forward

**Bye-Bye, Boxed Software:** Microsoft says its programs may be subscription-only in ten years.

19 **Geek Tech**

20 **Staff Picks**

## 23 Consumer Watch

**Digital Life After Death:** Make plans to ensure that your digital assets are handled as you wish.

24 **On Your Side**

25 **Skeptical Shopper**

## 27 Business Center

**Time-Saving Tips:** Learn ten simple ways to speed up basic work-related computing tasks.

28 **Simply Business**

29 **Net Work**

## 31 Security Alert

**Firefox Security:** Set up safer browsing in five steps, using Firefox's built-in tools.

32 **Bugs and Fixes**

33 **Privacy Watch**

## 34 Reviews & Ratings

**29-Inch Displays:** We evaluate three ultrawide monitors that will change the way you work.

37 **Toshiba Kirabook**

38 **Vizio All-in-One PCs**

40 **Seagate 600 SSD**

42 **Sony Experia ZL**

43 **BlackBerry Q10**

44 **Over-Ear Headphones**

46 **Corel VideoStudio X6**

## 86 Here's How

**Ubuntu Guide:** Make the transition from Windows to Linux without fear and trembling.

91 **Answer Line**

93 **Hassle-Free PC**

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# Editor's Desk

JON PHILLIPS

# Meet the PCWorld of the Digital Age

THIRTY YEARS AGO, *PCWorld* published its very first issue, a magazine packed with essential advice for PC early adopters. It was a pioneering publication written by, and written for, tech enthusiasts.

Fast-forward 30 years: Our hardware has changed dramatically. Processor performance has increased exponentially, and we no longer run various versions of DOS. But like the *PCWorld* of 1983, today's *PCWorld* remains committed to the basic tenets of technological progress: We love consumer electronics. We embrace forward movement. And we're interested in the many different ways we can use technology to make life more fun, convenient, and productive.

*PCWorld* has evolved in sundry ways since our first issue, but we haven't lost our pioneering spirit, and this month I am excited to introduce a new chapter in our history. Beginning with our September issue, *PCWorld* will be fully committing to all digital formats—marrying our magazine to the digital technology we write about—and leaving print behind.

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*Jon Phillips is the editor of* PCWorld.

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# Forum

The June *Editor's Desk* on Microsoft's move to a continuous development model for much of its software—especially Windows—unleashed a flood of extremely critical comments expressing fear and loathing of Microsoft, its track record, and its plans.

## Microsoft's Fast Updates: A Bad Deal?

About "Microsoft Needs Rapid-Fire Updates" (*Editor's Desk*, June), by Brad Chacos: Except for Windows 7, Microsoft has had a lousy track record on new products and updates for quite some time. If you use Windows like a toy and feel you need pretty pictures and dozens of extra wasted mouse clicks and menus to get something done, then by all means, buy into this rental model and spend most of your time dealing with such questions as "What's new in this release?" "How do I do this?" and "Why did my computer stop working?"

Real work environments, however, will continue to use the older software, somewhat locked down and configured for efficiency, and upgraded or updated when practical, without fear that upon the next reboot everything will have changed because of some rapid-fire update or upgrade.

And they will do this without being held hostage by Microsoft each year.

More responsive mainstream computing? No way. Just more continuous headaches—with a recurring price tag.

*Kevin Spatz, Ho-Ho-Kus, New Jersey*

As Mr. Chacos is probably aware, the price for just about every component of a modern computer has dropped over the past ten years—with the notable exception of Microsoft Windows.

Charging more for Windows, therefore, is clearly a step in the wrong direction. Instead, Microsoft should focus on genuine innovation instead of milking the same almost-dead cow even more.

Ultimately, trying to force people to subscribe to Windows will create more unusable equipment and more waste, as people refuse to pay indefinitely for computers as they age. I encourage Mr. Chacos to be a more critical thinker and less of a Microsoft cheerleader.

*Conrad Anthony, Winnipeg, Manitoba*

> Microsoft has flipped its lid if it thinks I will pay $30 to $50 for annual access to the latest tweaks and features.
>
> *C.E. Moore*
> *McKinney, Texas*

There is a war going on between [the new model of] locking users into cloud-based leased software that has incremental changes versus the purchase-to-own software practice of years past. Editor Chacos is in one camp, which wants the latest bells and whistles ASAP; I am in the other camp, where I want nothing stored or accessed in a cloud. (I live in the boonies, where DSL can be intermittent with the weather.)

*Jay Stevenson*
*New Franklin, Missouri*

**Editor's reply: Thanks for all the feedback. The online version of my article (go.pcworld.com/rapidupdates) better details why Microsoft's shift to continuous improvement is good for consumers, and why Microsoft is doing it for business reasons, not from the kindness of its heart.**

**Also, readers, fear not: Microsoft's updates will be optional (through the Windows Store), and the updates will not be automatic.**

*—Brad Chacos*

## Worst Tech Habits

Regarding "The 21 Worst Tech Habits, and How to Break Them" (June): Another reason not to use your laptop on your lap is that it can block the fans on the bottom (if your laptop has them) and cause your processor to overheat, especially if you have an older model of laptop.

*jonnywoh, PCWorld.com forums*

This article had some great tips. Nevertheless, I strongly disagree with a couple of them, as follows. »

ILLUSTRATION: GARY NEILL

*Failing to pick up the phone:* Sorry, but it's not my responsibility to worry about other people's time. If a fancy lawyer is calling me, he or she can simply leave a message, as anyone else would.

*Cleaning out the inbox:* I fail to see the analogy between a physical desk and my email. After all, I don't have a handy search feature for my physical desk.

In my view, being able to search for email (something Gmail and Outlook can do fairly quickly) renders the Inbox Zero ideal largely irrelevant.

Plus, I don't have a good grasp on what email I will need later. So why waste my time organizing and deleting email when a search function can quickly bring up pretty much any email message that I happen to need?

*sadastronaut, PCWorld.com forums*

So printing anything is a bad habit—really? I'm sorry, but there are some things that I need a tangible copy of.

*TheWatcher00, PCWorld.com forums*

One bad tech habit not mentioned in the article: buying too much tech stuff to keep up with everyone else. Today I'm like a tech hoarder on steroids. Need a cable? You've come to the right place. Need an older, smaller hard drive, or some old memory? Right place again.

*mipa, PCWorld.com forums*

## Alternative Search Engines

Regarding the June *Privacy Watch* on Web search engines ["Get Your Privacy Ducks in a Row"]: Startpage (startpage.com) is even better than DuckDuckGo. It's the same as Google without the surveillance. For more than Google, just use Ixquick (ixquick.com), Startpage's twin. Both engines are older than DuckDuckGo.com and provide complete search privacy.

*Steven Garren, Winder, Georgia*

I've pretty much used Google only, but with DuckDuckGo, I was blown away by all the results I didn't see in Google because of its filter bubble.

*Gil Drees, London, Ontario*

**CORRECTION**

**IN THE ARTICLE "How Companies Get You to Keep Buying New Stuff" (*Consumer Watch*, May), the byline should have identified the author as Jeff Foster.**

***PCWorld* regrets the error.**


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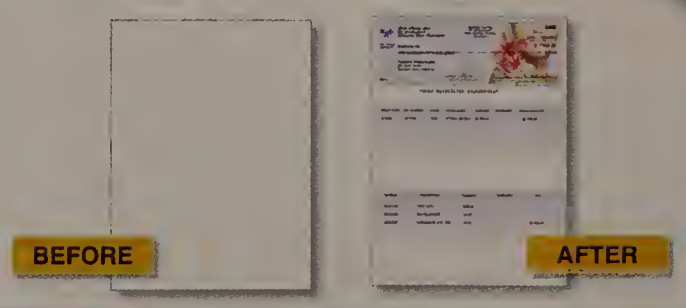

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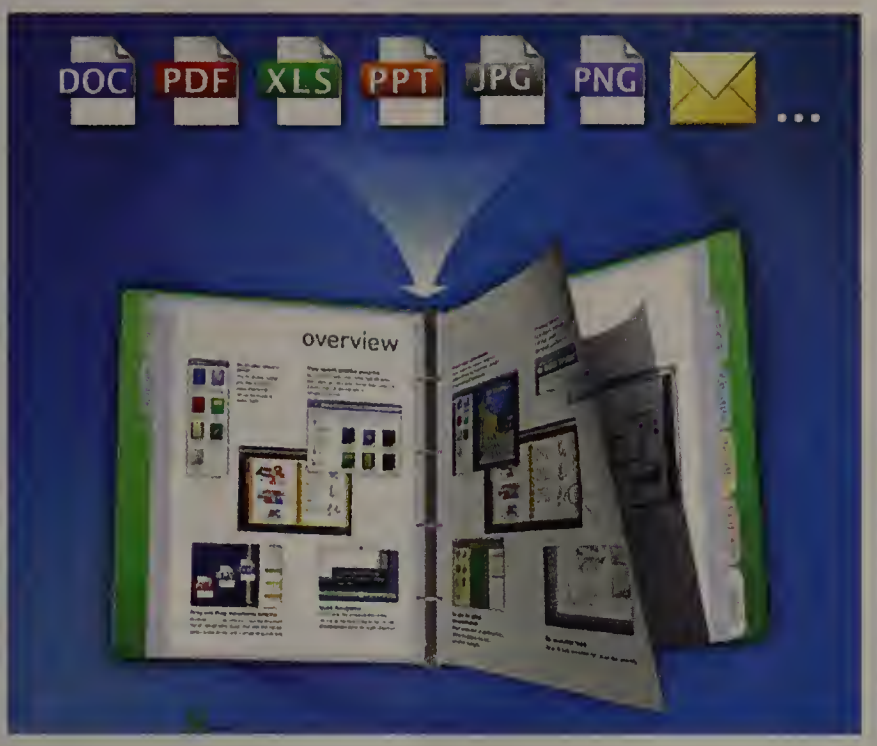


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### TABLETS AND PCS

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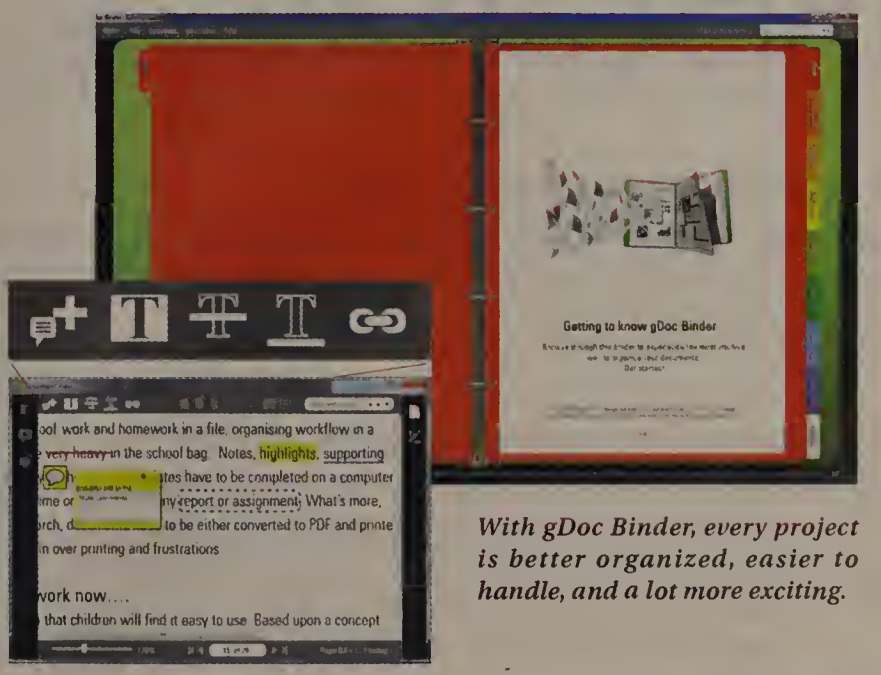


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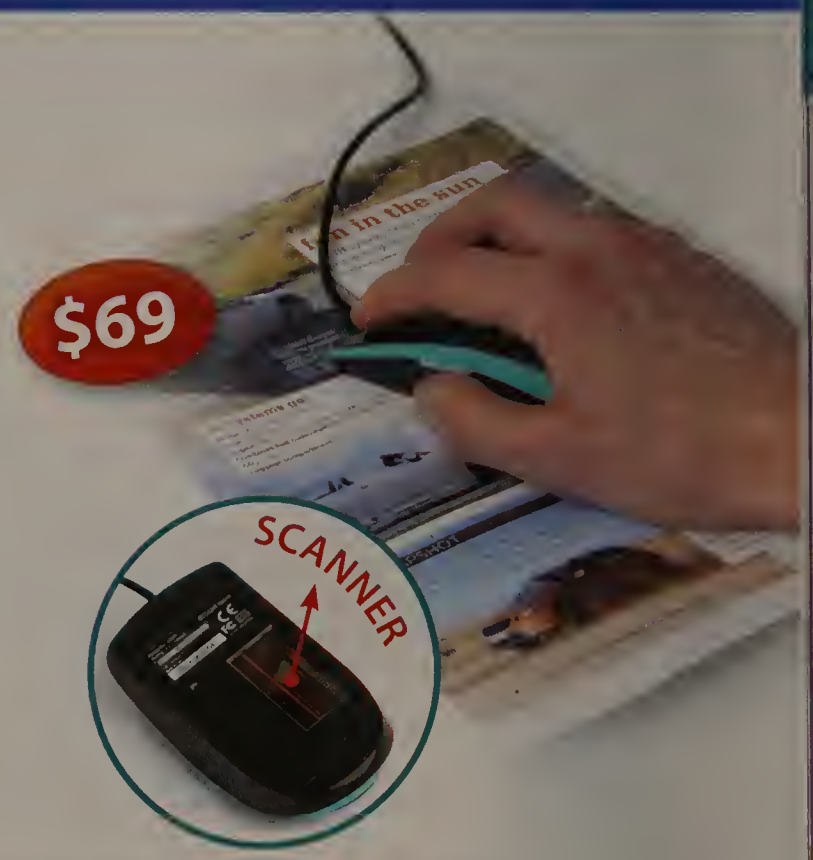


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# Boxed Software: Going, Going, Gone

**BY IAN PAUL**

**Microsoft is making plans for a future in which people will pay for software by subscription instead of buying boxed versions of programs.**

EVER SINCE JANUARY, when Microsoft introduced Office 365 Home Premium subscriptions, we've been wondering when the company might give up on packaged versions of Office. Now we may have our answer, from Redmond itself.

The software giant is betting that, over the next ten years, most people will pick subscriptions over traditional boxed software. "We think subscription software-as-a-service is the future," Microsoft says on its official Office blog. "Within a decade, we think everyone will choose to subscribe because the benefits are undeniable."

Microsoft says, however, that for now it will continue to offer packaged Office suites as well as Office 365 subscriptions, saying that the transition will take some time.

These comments follow Adobe's announcement that it was dumping Creative Suite as a software package and going all in with its Creative Cloud subscription service.

The biggest benefit of subscription software is that it is always up-to-date, Microsoft says. Add-on services such as extra SkyDrive storage can easily be integrated into a yearly fee scheme, too.

Office 365 Home Premium currently costs $99 per year or $10 per month. A subscription brings you the complete, and most recent, Office suite (currently Office 2013), which includes Word, Excel, PowerPoint, OneNote, Access, Publisher, and Outlook.

You also get an extra 20GB of SkyDrive storage, and »

ILLUSTRATION: ADAM McCAULEY

60 Skype calling minutes per month. You can install the Office suite on up to five different PCs in your home, with each installation personalized for family members.

## Cost of Ownership

If you're just looking for the basics, however, the new subscription plan for Office may not be ideal. Over the next three years, an Office 365 subscriber will pay $297 to have Office; buying the standalone version up front would cost just $149.

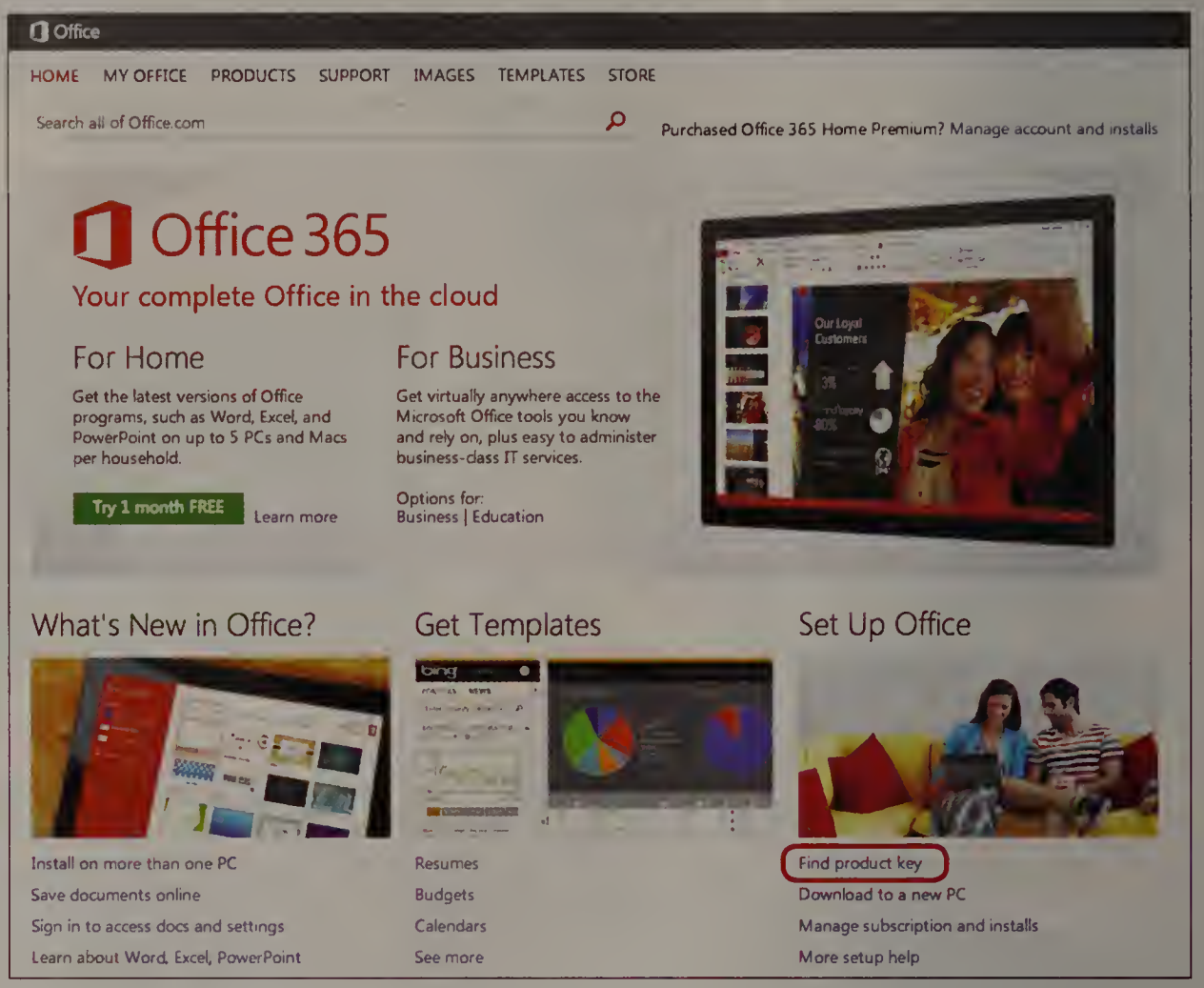
"Cost of ownership is far lower for me buying Office, rather than subscribing," said Geoff Coupe in the comments on Microsoft's blog post. "So long as that remains so, I will continue to buy."

That assessment may remain valid if Microsoft continues to roll out Office (as it always has) in several-year increments. But the company is trending toward a rapid-release cycle for all of its products, including Office, and this may mean that the next major Office upgrade will be via gradual updates over the next three years and beyond.

To get the latest and greatest Office updates, then, you would have to be in the subscriber stream or wait to get all the new features at once.

## The Legacy OS Issue

Another potential downside to software subscriptions is the issue of legacy platforms. You may now be running Windows 7 or 8—platforms that today's Office was designed to run on. But what about future versions of the suite? Microsoft will inevitably dump Office 365's current support for Windows 7 and 8 at some point. Do you continue paying $99 per year for an Office subscription that no longer delivers new features or security updates? Maybe a stand-alone version was the better buy after all.




**You can use** cloud-based Office 365 to work anywhere on your mobile devices, online or off.

## OS Subscriptions?

What if Microsoft begins to offer Windows as a subscription also? The company did say the future was "subscription software-as-a-service."

Rumor has it that Microsoft may create a cloud-based version of Windows for enterprises, which invites speculation about a Chrome OS–like future for Windows that may involve OS subscriptions.

What if Microsoft isn't planning a remotely accessed Windows for consumers at all, but rather wants to introduce annual subscriptions to the desktop version? Under that scheme, you would never have to worry about Office becoming too advanced for your OS because you'd always have the newest OS.

You might have to get new hardware to keep up with Windows every few years, but not that often, considering that Windows 7 and 8 system requirements are reasonably similar. And Microsoft already offers Windows software subscriptions to IT professionals via its TechNet service, so why shouldn't it consider creating a consumer equivalent?

## Service-as-a-Negative

There would, however, be some problems with converting Windows into a subscription service with annual fees.

PC sales are already plummeting. Continuous Windows upgrades would give consumers yet another reason to hold on to their current PC.

Before companies like Acer and Samsung have reason to freak out, however, Microsoft will have to persuade people to pay for Windows every year. That's difficult when most people have never directly paid for Windows at all and consider it to be part of the cost of buying a new PC.

So Windows subscriptions would be a tougher sell compared with Office—but they could still be the future.

# How Gmail Will Sort Your Email for You

GOOGLE HAS announced a new kind of inbox for Gmail that automatically sorts messages into categories, or "tabs." Updates from Google+ and other networks go into a Social tab, deals and offers into a Promotions tab, forum messages into a Forums tab, and receipts and bills into an Updates tab. Most other types of messages will be in the Primary tab.

On the desktop, the new tabs will appear just above the inbox, so you can switch between them with one click.

On Gmail for Android (4.0 and up) and iOS, non-Priority tabs appear in the left sidebar menu, and as teasers in the main inbox view.

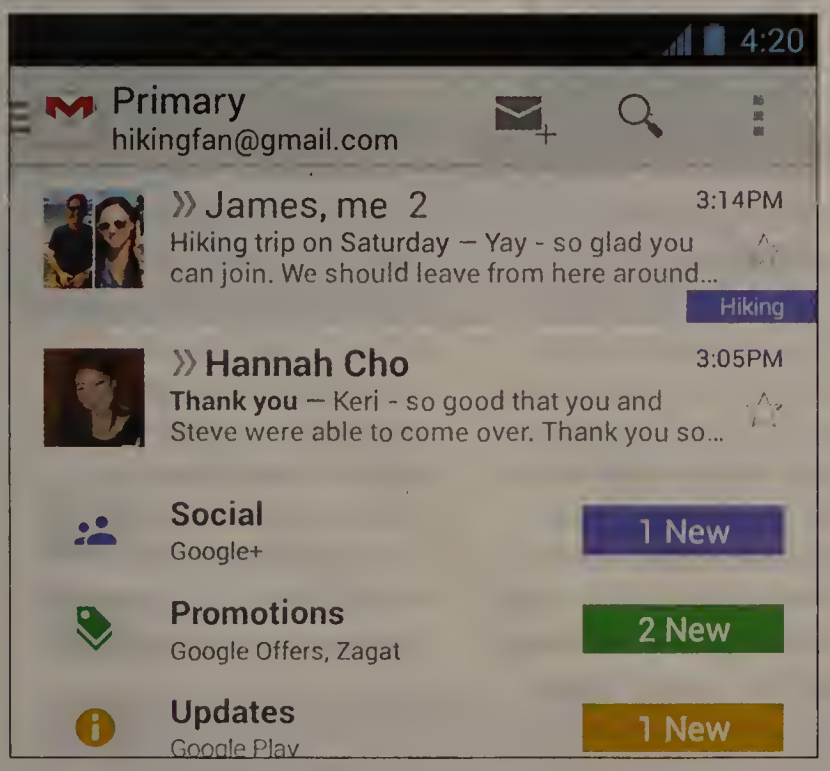
The auto-sorting inbox isn't mandatory. In a blog post, Google says users will be able to switch back to the Classic view, or use Priority Inbox.

The new inbox does seem reminiscent of Priority Inbox, which launched nearly three years ago. With Priority Inbox, Gmail attempts to figure out which messages are most important and brings them to the top. (The feature's reception has always been mixed.)

For users who don't receive a lot of deals and notifications, the additional tabs may be a hassle, as they'll require more effort to sort through.

And we'll have to see whether Gmail's algorithms work properly and don't end up putting important email into non-Primary tabs.

At this writing, Google says it's rolling out the new inbox gradually. On the desktop, look for a 'Configure inbox' option beneath the gear icon.—*Jared Newman*




**Google's Gmail** tweaks will be available on Android, too.

## BRIEFS

### Netflix Plans to Double Its Original Content

**Netflix's newfound love affair with original content isn't disappearing anytime soon: Reports claim that the company wants to double its original-programming slate in 2014. That would give Netflix eight different series next year, according to the *Hollywood Reporter*. *House of Cards*, a critically acclaimed political drama released in February, has been the service's biggest and most widely studied original launch.**

### Soon You Can Order Shrimp on Amazon

**Amazon already delivers soup to nuts at fast speeds, especially if you shell out $79 a year for Amazon Prime, which brings free two-day shipping on thousands of products. Now Reuters reports that Amazon plans to roll out AmazonFresh in up to 40 new markets (it's already in Seattle), delivering fresh produce and other quick spoilers along with your Kindle books.**

### HTC One Coming to Verizon Before Fall

**Though Verizon has a number of HTC phones, the flagship HTC One has been available only on the other national carriers (and some regional ones). Verizon tweeted recently that the HTC One would be available on the company's LTE network "later this summer." Pricing wasn't announced, but the phone may be about $200 (with a two-year contract) or less.**

### Halo Infiltrates Windows 8 Mobile Devices in July

**Halo: Spartan Assault—the newest addition to the popular game franchise—is designed to be compatible with Microsoft mobile devices. Players can tap and swipe their way to military domination (classic keyboard and mouse controls remain). The game will also support cloud saves and multi-device syncing. It will reportedly cost about $7.**

# Samsung, Intel to Stream Media From PCs to TVs

SAMSUNG TVs WILL be able to play movies streamed directly from PCs running Intel's latest processors by the end of this year.

In June, Intel and Samsung announced a joint effort under which the chip maker's Wireless Display technology would be integrated directly into Samsung's TVs. That integration will eliminate the need for a separate receiver to play PC content on TVs.

Samsung is a big customer win for Intel. Around 10 million TVs from manufacturers including LG, TCL, and Toshiba already have Wireless Display integrated; with Samsung, that number will double by the end of the year, Kirk Skaugen, senior vice president and general manager of Intel's PC Client Group, says.

Wireless Display capabilities are available in Intel's latest Core processors. Intel has said that it will eventually put the media-streaming chip in mobile devices such as smartphones and tablets.

Microsoft's upcoming Windows 8.1 operating system will augment the media-streaming technology with new features, Skaugen says.

The Wireless Display technology is part of Intel's effort to make its latest Core processors, code-named Haswell (see page 77), more appealing to buyers. The chip maker also launched new dual- and quad-core processors for desktops, laptops, and hybrids at the recent Computex trade show in Taipei, Taiwan.

Samsung already offers technology through which users can share video wirelessly between tablets, smartphones, TVs, and other Samsung devices. The technology is based on DLNA interoperability guidelines and requires devices to be connected to a Wi-Fi network.—*Agam Shah*

## TECH SPOTLIGHT: FOUR HASWELL-BASED LAPTOPS

### ACER ASPIRE S7-392 SERIES

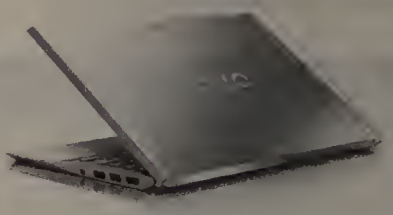
The Acer Aspire S7-392 Series looks light and airy, but don't let that fool you—this 13-inch Windows 8 Ultrabook is stacked with features, including a discrete Nvidia GT735M graphics card, wireless display technology, the option of either an Intel Core i5-4200U CPU or a i7-4500U processor, 8GB memory, and a 128GB or 256GB SSD. Pricing will range from $1400 to $1700.
**go.pcworld.com/aspire392**

### ASUS ZENBOOK INFINITY

Asus's superthin but durable Zenbook Infinity is the first laptop from the company to use Gorilla Glass 3 on the back of the display and on the keyboard surround. This Zenbook's 13.3-inch multitouch display has a resolution of 2560 by 1440 pixels, and the unit measures just 0.61 inch thick. The laptop is scheduled for release sometime in the third quarter; pricing is not yet available.
**go.pcworld.com/asusinfinity**

### RAZER BLADE PRO

The Razer Blade Pro costs a whopping $2299, but that buys you an Nvidia GeForce GTX 765M graphics card, an Intel Core i7-4700HQ quad-core processor, a 17-inch LED display, and Razer's Switchblade touchscreen/keyboard user interface. All of this makes the Blade Pro one of the most formidable gaming laptops around, from a company noted for premium gaming hardware.
**go.pcworld.com/bladepro**



### SONY VAIO PRO 13

This sexy 13.3-inch touchscreen Ultrabook is outfitted in carbon fiber and aluminum, and it is also the first laptop on the market with a fast PCIe SSD. The $1249 Pro weighs 2.34 pounds, has a 1920-by-1080-pixel display, and a fourth-gen Intel Core processor.
**go.pcworld.com/vaiopro13**

(For more on Haswell processors and Haswell-based laptops, please see page 77.)

recent Computex
show in Taipei, Taiwan.
nsung already offers
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can share video wire-
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**Back-UPS models are available with the features and runtime capacity that best suit your application, and many models have been designed with power-saving features to reduce costs.**

### The High-performance Back-UPS Pro Series

High-performance Back-UPS Pro units deliver cost-cutting, energy-efficient features. Power-saving outlets automatically shut off power to unused devices when your computer and peripherals are turned off or on standby, eliminating costly electricity drains. (BR700G shown above)

### The energy-efficient ES 750G

The ES 750G boasts out innovative power-saving outlets, eliminating wasteful electricity drains when equipment is not in use.

- 10 outlets
- 450 watts/750 VA
- 70 minutes maximum runtime
- Coax and telephone/network protection

### The best-value ES 550G

The ES 550 uses an ultra-efficient design that consumes less power during normal operation than any other battery backup in its class, saving you money on your electricity bill.

- 8 outlets
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- 43 minutes maximum runtime
- Telephone protection

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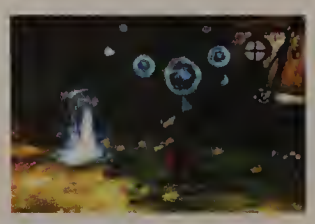
## GAMES-SHOW HIGHLIGHTS

# Xbox One Games From E3

**Dead Rising 3**
Dead Rising returns to the Xbox family sporting a darker, grittier look more akin to the Resident Evil series. Dead Rising 3's Xbox SmartGlass integration, its lack of load times, and its massive scale look to impress.

**Forza Motorsport 5**
This game taps into the Microsoft Xbox One's cloud connection and generates a "Drivatar" of you. It learns your tendencies, speed, and style, and continues to race in your stead even when you're offline.

**Metal Gear Solid 5: The Phantom Pain**
The latest installment in the Metal Gear Solid franchise, complete with open-world gameplay, is set in Afghanistan. The territory matches the gruff vocals of Kiefer Sutherland, the new voice of the legendary Solid Snake.

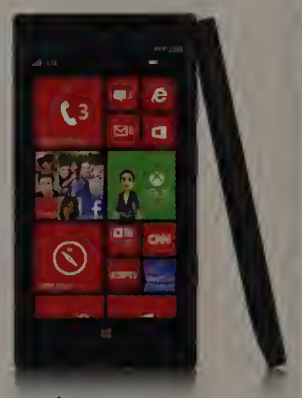


**Project Spark**
By playing Project Spark, you can become a game developer, crafting a fantasy world through voice commands to the Xbox One's Kinect and with the help of SmartGlass integration via a Windows 8 tablet.

**Ryse: Son of Rome**
This Xbox One game puts you in the shoes of Roman soldier Marius Titus, leading a horde of soldiers through a fortified establishment. You also take on numerous bad guys at once in a gory third-person view.

# Windows Phone Digs In

MICROSOFT'S WINDOWS PHONE accounted for 5.6 percent of all U.S. smartphone sales over the three-month period ending April 13, according to Kantar Worldpanel. That's up from 3.8 percent a year earlier. (Kantar's data is based on continuous surveys of more than 240,000 consumers, and measures recent sales, not market share.)



**Nokia Lumia 928**

Kantar found that 25 percent of recent Windows Phone buyers were repeat customers, and that 23 percent had defected from Android. In addition, the OS is gaining among younger users, Kantar claims.

Some major apps, including Hulu Plus and Pandora, have landed on Windows Phone 8 recently. Meanwhile, Verizon has finally decided to sell Nokia's Lumia 928.

These developments should help Windows Phone become just a bit more viable as a third ecosystem behind Android and iOS.—*Jared Newman*

# Eye-Fi Mobi: Better Wireless Photo Transfer

Eye-Fi's new Mobi wireless SD Card promises to make the business of wirelessly transferring photos faster, easier, and cheaper. The Eye-Fi Mobi uses Wi-Fi to let you connect directly to your smartphone or tablet, providing instant sharing opportunities.

The Mobi works through a free Eye-Fi app for iOS, Android, or Kindle Fire. Enter the card's unique ten-digit code to pair the card with one or more devices, and then you can transfer high-resolution photos and videos. The Wi-Fi range is 90 feet outdoors and 45 feet indoors.

The new Mobi (eye.fi/products/mobi) costs $50 for the 8GB card and $80 for the 16GB card.—*Jackie Dove*

PHOTOGRAPH: (TOP RIGHT) MIKAEL RICKNAS

# Can Net Data Be Saved?

ONE OF THE founders of the Internet, Vinton Cerf, is concerned that much of the data on it will become unreadable.

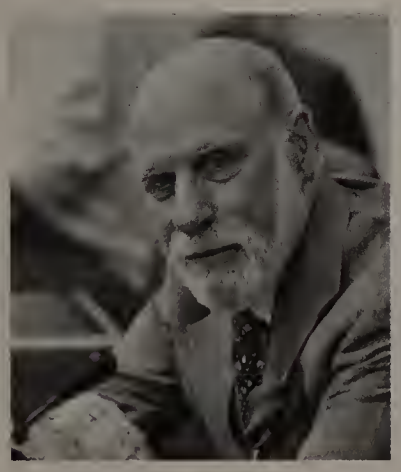
Cerf recently warned in an interview that digital documents and scientific data will not be readable in the future.

Cerf noted that he runs Microsoft Office 2011 on a Macintosh, but that it can't read a 1997 PowerPoint file.

It's not just PowerPoint slides either, he said. The scientific community collects large amounts of data from simulations and instrument readings. But unless the metadata survives to tell under what conditions the data was collected, how instruments were calibrated, and how to interpret the units, the information may be lost.

For the sake of the future, "we need a digital vellum that will preserve not only the bits, but a way of interpreting them as well," Cerf says.

*—Patrick Thibodeau*



**Vinton Cerf** worries that online documents may be lost.

PHOTOGRAPH: (LEFT) VENI MARTKOVSKI COURTESY OF WIKIPEDIA COMMONS; (RIGHT) ARDUINO

**GEEK TECH**

# Arduino's First Robotics Kit Is Coming

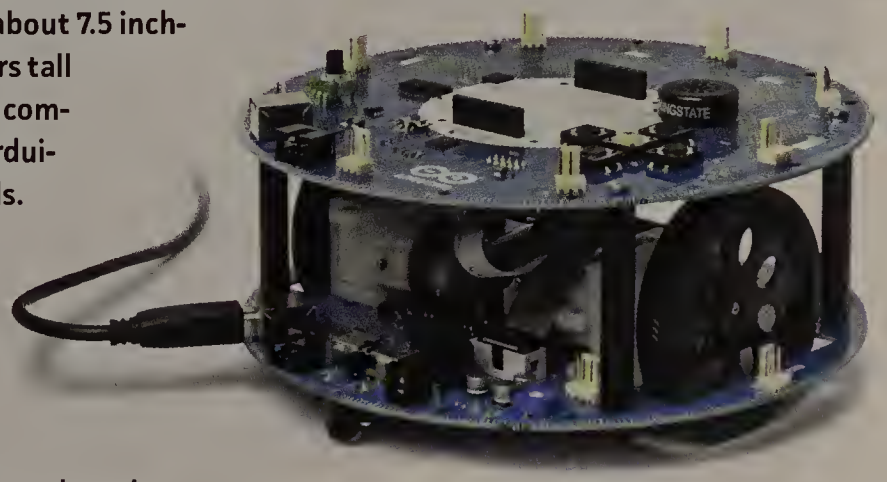
The microcontroller-board maker is entering the robotics market.

**ARDUINO HAS A history of making it easier to build your own electronics projects (see go.pcworld.com/arduino101). Now the microcontroller-board maker has entered the robotics market with something that it calls "the first official Arduino on wheels."**

**According to an announcement made in May, the company has teamed up with Complubot, the four-time world champions in the Robocup Junior robot soccer tournament, to create a new Arduino robotics kit. Its hardware is completely open-source—just like a regular Arduino board—so you can change the software controlling the robot or stack your own hardware on top of it.**

**The kit comes with everything you need to get started on your first robotics project, including the hardware, software, and documentation. Also included are both a new version of the Arduino developer tools and a new TFT (thin-film transistor) screen.**

**The robot measures about 19 centimeters in diameter (about 7.5 inches) and 10 centimeters tall (about 4 inches), and comprises two stacked Arduino boards with wheels. Each board comes with a 16MHz processor and 32KB of flash memory.**



**Arduino's** kit for building your own robot is open-source—and has wheels.

**The lower board—which is called the motor board—controls the machine's movement. The upper board reads sensors and decides how to operate the machine. A USB port on the kit does double duty, since it's both for programming this small machine and for replenishing the four rechargeable AA batteries.**

**Arduino's open-source robot also comes equipped with a set of sensors, including two potentiometers, five buttons, a digital compass, and five floor sensors (so that it knows when it has knocked into something). The hardware includes a speaker, two motors, an SD Card reader, and a set of the aforementioned rechargeable AA batteries.**

**Otherwise, the Arduino Robotics Kit is something of a hodgepodge of open-source Arduino boards on wheels with plenty of prototyping space and TinkerKit connectors for expansions. If your little bot requires more flair, MakerBot has rolled out a new expansion pack for the Arduino kit that lets you add an IR sensor, an ultrasonic sensor (which sounds like just about the coolest thing ever), and a bunch of LEDs.**

**You can order your Arduino robotics kit right now from Maker Shed for $275 (at go.pcworld.com/makershedard). Maker Shed also sells the expansion kit separately for $100 (at go.pcworld.com/arduinoexpansion). For more information and all the technical details, visit the Arduino site at go.pcworld.com/arduinorobot.***—Kevin Lee*

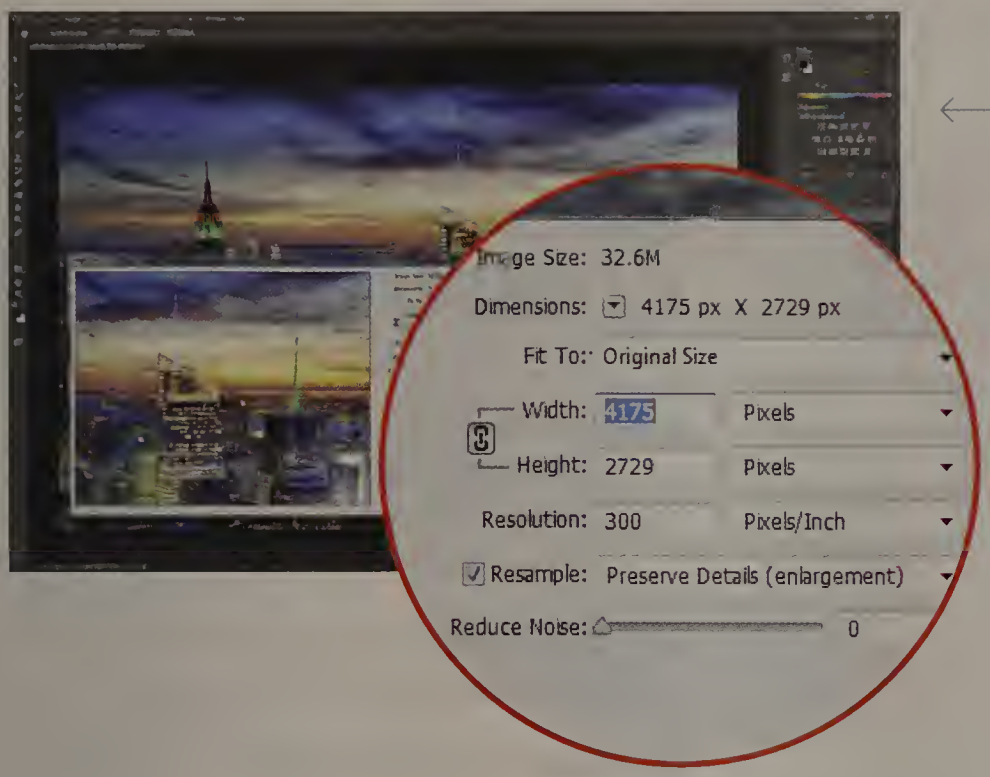
Visit the Geek Tech blog at go.pcworld.com/geektech for hacks, tips, and hardware news.

# Staff Picks

## NEW PRODUCTS THAT HAVE OUR EDITORS DROOLING

### Oculus Rift Virtual Reality Headset

Once you strap this virtual-reality gaming gizmo to your face, its built-in sensors image your head's movement through space. The $300 Rift then translates that data into a stereoscopic 1080p virtual world. Available for preorder. go.pcworld.com/oculusrift




## Adobe Photoshop CC

Newly updated Photoshop CC is one piece of Adobe's new Creative Cloud subscription service (the company is dropping traditional software licenses). Photoshop ($20 a month for a year's subscription) now contains such improvements as camera-shake reduction and a revamped Smart Sharpen filter (shown here) designed to minimize noise and halos during sharpening. go.pcworld.com/photoshopCC

## Asus VivoMouse

The *USS Enterprise*–like VivoMouse is a hybrid touchpad and remote control. It functions traditionally—by sliding on a surface—or airborne, as a handheld touchpad. Click or swipe the disc with multitouch gestures such as pinch zoom and two-finger scrolling. It will be available in Q3. go.pcworld.com/vivomouse

## Acer Iconia W3 Keyboard

The tiny Iconia W3, the world's first 8-inch Windows 8 tablet, can also act like a laptop with the release of a $90 companion keyboard (the tablet itself will cost $400 to $500). Unlike some attachable keyboards, this one is larger than the tablet (close to laptop size). It also has a hollow space underneath for storing the tablet (so both parts are very portable) and connects via Bluetooth. go.pcworld.com/w3keyboard

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# How to Get Your Online Assets in Order Before You Die

**Here's what you need to know to ensure your digital life, or that of a loved one, is handled the way you want.**

**BY CHRISTOPHER NULL**

ONE DAY EACH of us is going to die. Our Facebook accounts, however, will most likely live on.

If Facebook really has a billion users, then, statistically speaking, 20,000 of them or more die every day. If you're concerned about what will happen to your digital assets once you've shuffled off this mortal coil, it's wise to think about your digital will while you're working on your financial one.

## Prepare Your Accounts

Strategies abound for those looking to ensure that their beneficiaries can access or close down their accounts in an orderly way.

The simplest course of action is to leave passwords for your accounts with a trusted person or put them in a secure place so that the people you've specified can access them after your death. You could leave a list of accounts and logins with a lawyer, a spouse, or a close relative via an attachment to your will, or put the list in a safe deposit box that you authorize certain individuals to open after your death. However, these methods require substantial upkeep. If you change a password or add a new account, you'll need to update the list. And what happens if that list falls into the wrong hands? Or if your marriage dies before you do?

A host of third-party tools have arisen to help.

## Online Tools

Assets In Order (assetsinorder.com) offers a tool called Your Legacy Lockbox for storing wills, powers of attorney, photos, letters, account info, and more in an online safe that can be opened only after your death. Your data remains secure unless *verifiers* (people you've named in advance) present a death »

ILLUSTRATION: EMILIANO PONZI

certificate or a notarized letter confirming your death. A free plan covers the basics; $20 a year buys more storage and notification of more *recipients* (people you've allowed to have your info).

Legacy Locker (legacylocker.com) is virtually identical to Assets In Order, offering both a free plan and a paid one for $30 per year or a one-time fee of $300.

Personal (personal.com) isn't designed exclusively for data inheritance, but you can use it for succession planning. Personal can store your data and your documents, including your Facebook and LinkedIn profiles. Your passwords stay up-to-date if you change them. Personal also partners with Everplans (everplans.com), which helps people manage end-of-life decisions about financial, legal, and estate planning matters.

With Google Inactive Account Manager (go.pcworld.com/giam), you tell Google what you want it to do with your Picasa photos, YouTube videos, Gmail, and more in the event that you don't log in to your account after a certain amount of time you've specified. People you've chosen are then notified that they can download your stuff for three months after that, after which your accounts will be deleted if you so choose.

## No Preparations

If a loved one has died without making the proper preparations, you'll have to go through each service they used to request action, whether you want the account deleted, the data in it transferred to you, or the account frozen in time as a memorial. Each service has different rules about what you must provide, but generally you need proof of the person's death as well as proof that you have the right to access their files.

Beyond that, companies such as Dropbox, Facebook, Google, Microsoft, Twitter, and many others have their own digital-inheritance policies. Doing a Web search for "*servicename* deceased" is the quickest way to find each site's policy.

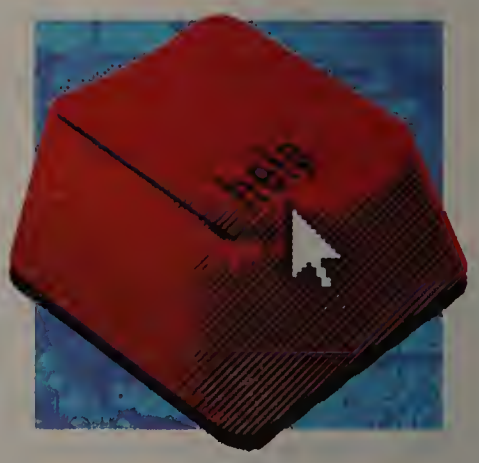
# ON YOUR SIDE

**LAST FALL I bought Photoshop Elements 10 at Costco. I now have a new computer and would like to install the program on it, but I have lost the key, which I need to install the program. I have already wiped the old computer for my granddaughter. When I first set up the program, it asked me to register and said that Adobe would provide the key if needed. Adobe also gives you online photo storage and sharing space you can access with your own password, but to get to it you need to have the program installed. I know I still have the Adobe space, because the company emailed me recently to tell me that I need to change my picture storage and sharing before June 18, 2013. I have tried three times to get this key, but Adobe says that since I have no proof-of-purchase number, they cannot help me because I never registered the program. But if they have given me storage and sharing space with my own password, how can they say I never registered the program? I know it is my fault that I lost the key, but it doesn't make sense to get a program without a key to install it. I'd appreciate anything you can do to help.**

*—Bob Jones, South Riding, Virginia*

ANNE KANDRA

**OYS RESPONDS: We contacted Adobe, and a company representative confirmed that they located Jones's Adobe ID, but said that the software had not been registered with that ID. The company provided Jones with a new copy of Photoshop Elements and offered this advice: Whenever you change to a new computer, always deactivate your software before wiping the unit. All Adobe perpetual licenses (any software that comes in a box or that has a product-specific serial number) can be installed on two computers; but if you don't deactivate the software, the serial number will continue to be viewed as in use, even if the program has been removed from the computer.**



**The company also suggests that users always create an Adobe ID. If you ever lose your serial number and want to reinstall the software, you can contact Adobe Customer Support, provide your Adobe ID, and receive the serial number. You can tie your Adobe ID to an email address, so if you ever forget your username or password, you can have the information sent to your email address. That said, we don't recommend using the name approach for recovering an Adobe ID; it's just too hard to populate an exact match given the various numbers of aliases, nicknames, or duplicate common names.**

**Another tip: Keep all your passwords, software keys, and other useful information in a secure password manager, such as LastPass (lastpass.com).**

**Have you run into a problem with customer service, a warranty, a rebate, or the like for your gear? Email us at onyourside@pcworld.com.**

ILLUSTRATION: GARY NEILL

## SKEPTICAL SHOPPER

# Find Online Tech Support You Can Trust

When you need help in a hurry, timely and effective tech support is just a few clicks away. Here's what to look for in a service provider.

**WE'VE ALL been there:** Time is short, deadlines loom, and a mysterious glitch has stopped your computer in its tracks. You've gone through the usual bag of tricks, and now it's time to try an outside resource. Here are some good bets.

**1. Start with the freebies:** CyberTechHelp.com, Suggest-A-Fix.com, and TechGuy.org, among other sites, have comprehensive forums on a wide range of topics. Also, conducting a Web search on the error message or a quick description of the problem can be fruitful.

**2. Use recommendations based on firsthand experience:** Ask family, friends, and colleagues about their experiences with tech support companies. Did the company solve the problem? How long did it take? How much did it cost?

**3. Beware of misleading company names and search results:** A site that calls itself "Microsoft Tech Support," for example, isn't necessarily affiliated with Microsoft, nor is it necessarily better qualified to deal with a Windows problem than another service.

**4. Check for contact information on the site:** You should be able to easily find the company's full contact information and a privacy statement. Some sites even let you browse profiles of individual technicians so that you can try to match their expertise with the problem you're having.

**5. Look for signs that the company actively engages with customers:** Does it have forums, and does it participate in them often? The more posts you find, the better. Does it publish blogs? Also, check the website to see if it features up-to-date versions of the hardware and software the company services.

**6. Look for sites that offer phone, chat, and remote-access support options:** Remote access can be unsettling if you've never used it before, but it is generally safe and can save you a lot of time and frustration. Also, some services, such as GeekSquad, offer both a physical location and visits from technicians if necessary.

**7. Get the straight scoop on price before you sign on:** Look for clear, straightforward price plans and details such as free trials, guarantees, and money-back policies. Many services charge an annual fee for unlimited 24/7 service, but how likely are you to need the service again? Some also offer service for individual incidents. Find out how they charge in such cases, and be careful about hourly-fee plans—those hours will add up quickly.

**8. Look for independent testimonials:** Do a Web search for customer feedback, check the Better Business Bureau's site, and look for the Truste and BBB logos on a site's homepage (and click the logo to ensure that it's legit).

**9. Prepare ahead to make the session as effective as possible:** Assemble a timeline of events, a list of precise error messages, all software versions, and hardware specs. (For more tips, visit go.pcworld.com/tstips.) —*Anne Kandra*

ILLUSTRATION: EMILIANO PONZI

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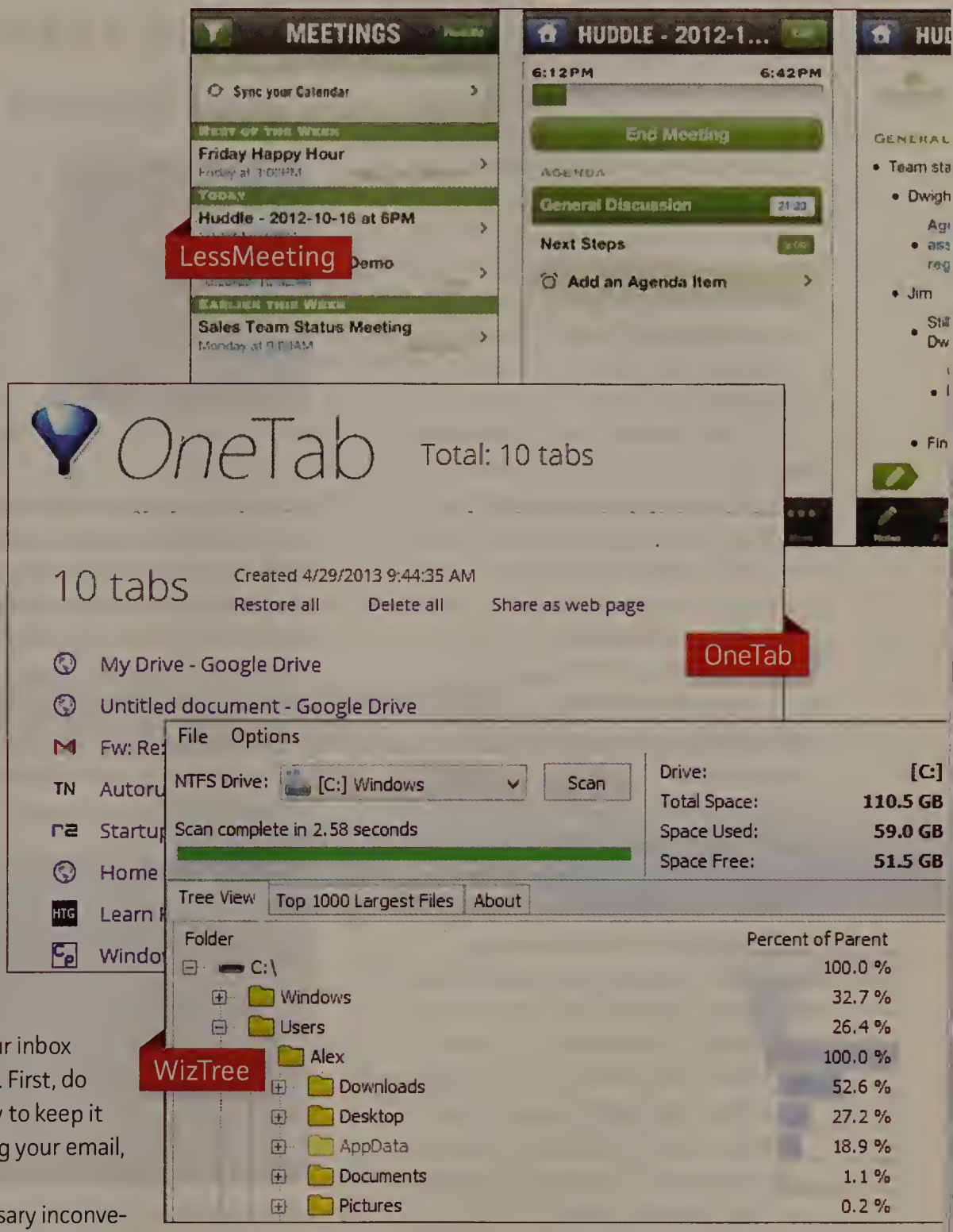
# Time-Saving PC Tips and Tricks

These ten shortcuts will help you speed up even the most basic computing tasks.

**BY ALEX CASTLE**




WHAT'S THE BEST way to tell an expert PC user apart from a bumbling amateur? The expert doesn't waste time. Here are ten simple things you can do to waste less time while using a PC. (Find more time-saving tips and links at go.pcworld.com/timesavers.)

**Tame your email with Inbox Zero:** Email is a core tool, but also a huge time waster. Organize your inbox today, and you'll save minutes every time you log in. First, do whatever it takes to empty your inbox, and then try to keep it that way. Among the popular systems for organizing your email, Inbox Zero is a snap to start using.

**Cut meetings down to size:** Meetings are a necessary inconvenience, but you can make them zippy. The meeting-minutes service with the strongest emphasis on speed is Less Meeting. It offers note-and-minute-keeping features along with a set of timers to help you cut meetings before people start snoozing.

**Learn Microsoft Office keyboard shortcuts:** To master any application, your fingers must memorize its hot keys—the keystroke combinations to navigate without the mouse. You probably know most of the basic ones, such as <Ctrl>-C for copy, but there are tons more in Windows as well as in every desktop app.

Don't sit down and study a hot-key cheat sheet. Instead, try KeyRocket. It runs in the background while you use Word, PowerPoint, or Excel, suggesting shortcuts as you need them.

**Add a second monitor:** If you regularly work in multiple programs at the same time, minimizing and maximizing windows eats into your workday more than you realize. What are you waiting for? Get a second monitor. If you need maximum screen space to edit videos or do serious stock-market trading, maybe even consider more than two monitors.

**Use a disk visualizer:** If you tend to fill up your hard drive, only clearing up space as you need it, you're also slowing your computer considerably. Resolve to free up as much space as you can, right now. Try a hard-drive visualizer, like WizTree, which scans your drive and shows you where the biggest space hogs are.

**Disable the Win 8 password screen:** Passwords are important, but not always necessary. If you keep your PC in a locked space, and it's not full of valuable data (or the data is already password-protected), the Windows 8 lock screen is wasting time. To »

get rid of that screen, you need to access the Command Prompt, enter one command at the prompt, and then change a setting in a dialog box. It's easy, and you can see how to do it at go.pcworld.com/removepassword.

**Create a separate user account:** If you mix your personal and professional data on the same PC, it's time to draw a line between the two. Create a separate user account for doing work on your home computer, and you'll minimize distractions and more easily find work files and applications when you need them.

To create a new user account in Windows 8, visit the Settings screen and click the *Users* tab. At the bottom, you'll find the option to add a new user.

**Speed up your boot time:** If you've been using the same computer for a long time, chances are it has become sluggish. The culprits are startup programs that run every time you power up. Download a free utility such as Autoruns to see which programs are taking liberties with your Startup folder, and clear out the ones you don't need. If your boot process is still painfully slow, try using Startup Delayer to spread out your startup programs, so they don't all try to run at once.

**Cut down on tab clutter:** It's far too easy to amass lots of open tabs. That eats up RAM and slows your computer down. OneTab, an add-on for Chrome, can help. Whenever tabs start to get out of hand, just click the little OneTab icon. All of your open tabs will close and automatically be stored in a list. Later, you can browse the list and either reopen that one tab you need, or all of them at once.

**Use a business card OCR app:** If you're entering business cards into your address book by hand, you're wasting time. Get one step closer to going paperless by using an app with optical character recognition skills. Evernote Hello (available for iOS and Android) lets you snap a photo of a card from your smartphone, then scans the text, digitizes it, and adds the details to your contacts list.

## SIMPLY BUSINESS

# Core Features You Need in a Router

ERIC GEIER

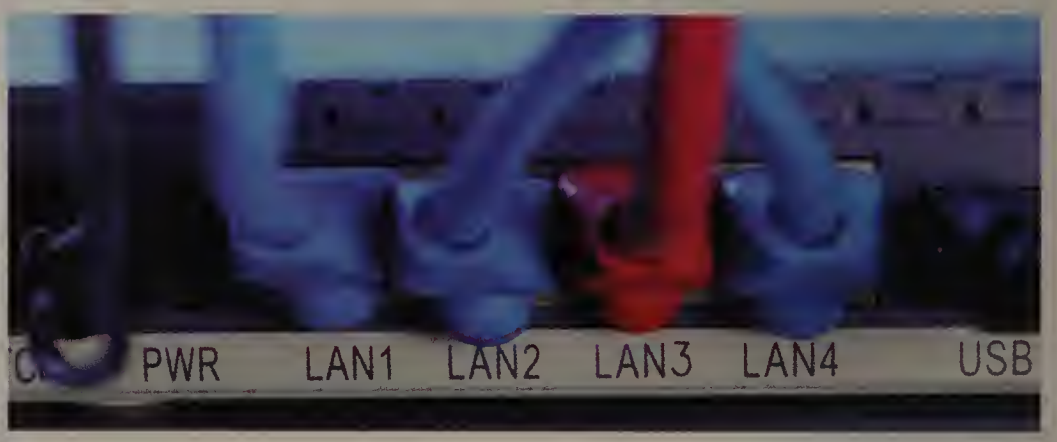
Choose your router carefully. Better models provide features that enhance your network and its performance.

**WHETHER YOU'RE SEEKING a consumer- or a business-class router, here are eight core features that you should look for.**

**Wi-Fi AP: Most routers have a built-in Wi-Fi access point (AP) to provide wireless connections for PCs and other devices. You can also buy APs to extend the router's range. A stand-alone AP can also add wireless capabilities to a wired router. Many wireless standards are in use. 802.11n is the latest ratified standard, and 802.11ac is in "draft" mode. If you're buying today, pick a model based on these two standards.**

**Guest Wi-Fi access: Some consumer-class routers include wireless guest access that allows you to broadcast a separate wireless network name (SSID) with different security settings so that guests can't access your main network.**

**Virtual LANs and multiple SSIDs: Many business-class routers allow you to create multiple, separate customized networks using what are commonly called virtual LANs. They also enable multiple SSIDs to offer virtual wireless networks.**




**Many routers** let you create separate customized networks using VLANs.

**VPN Server and Client: Some business-class routers include a virtual private network (VPN) server and/or client. A built-in VPN server allows remote users to securely access your network and files when away. And with a built-in VPN client, you can connect the router to another router that has a VPN server.**

**USB port: Some consumer- and business-class routers include a USB port so that you can share a USB printer or external drive with the network.**

**Malware and spam protection: Business-class routers that include additional security features are called unified threat management (UTM) gateways. They typically include antivirus, antispam, and content filtering.**

**Dual or backup WAN port: A business-class router with two WAN/Internet ports (or 4G support) provides an additional Internet connection for backup.**

**RADIUS server: A few business-class routers include a built-in RADIUS server that enables you to assign a username and password to each user.**

## NET WORK

# Five Quick Steps for Using LinkedIn for Recruitment

DOUG DRINKWATER

Find your company's next great candidate using LinkedIn's recruitment tools.

**IF YOU'RE USING LinkedIn only as a glorified business-card collector, an email replacement, or a kind of Facebook counterpart for business contacts, you're missing out on its recruitment potential.**

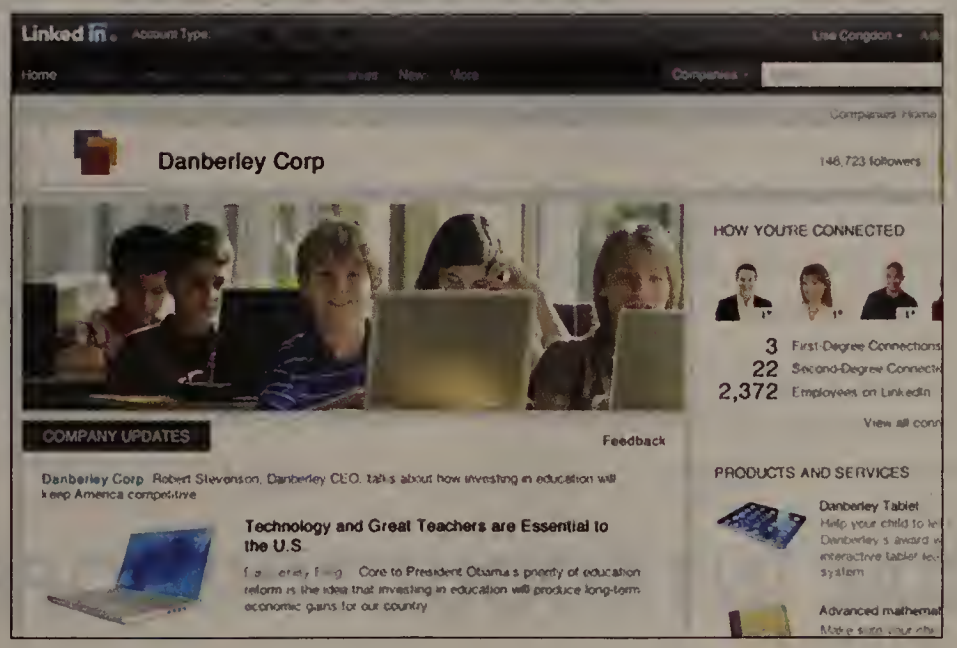
**With 200 million users, LinkedIn has been making great strides to offer better tools for searching and posting jobs. Here are five ways your business can use LinkedIn for recruitment.**

### 1. Approach anyone via Talent Finder

**The free version of LinkedIn may not cut it for finding suitable employees, but that should not be the case for the premium LinkedIn Talent Finder.**

**Businesses can use Talent Finder to contact all LinkedIn members with the InMail feature, see expanded profiles, get more search filters, and even discover candidates who are not actively seeking a job.**

**LinkedIn Talent Finder costs about $75 per month, but this is a good value considering that most businesses spend around $3000 per hire.**




**LinkedIn's** company pages help put a face on your brand.

### 2. Get a professional look with company and career pages

**If you haven't done so already, one of your first tasks as a LinkedIn power user should be to set up a free company page. Just click *Companies* at the top of the homepage, and choose *Add a Company*. Having a company page enables businesses to provide details on your company and products, and to list jobs with an add-on Careers Page.**

**You will have to pay to set this up, but upon doing so, you'll be able to provide insights about what it's like to work at the company, as well as post videos, blogs, and even testimonials from current employees. Plus, any posted jobs will automatically link to your company page.**

### 3. Measure the effectiveness of your recruiting

**Of course, you'll want to measure the effectiveness of your LinkedIn recruitment, and that's where the new Talent Brand Index comes into play.**

**The Talent Brand Index measures the reach of your brand and the number of people engaging with it (such as the LinkedIn members viewing your jobs or profile pages). It also gives you a Tablet Brand Index score. You can drill down into how effective you are when judged by geography or against your peers, or even over a period of time.**

### 4. Jump ahead with Sponsored Jobs

**Perhaps the most obvious way of attracting employees is by using Sponsored Jobs. LinkedIn says members are three times more likely to apply for a Sponsored Job than to find a job any other way.**

**How does Sponsored Jobs work? You bid for the top placement in its "Jobs You May Be Interested In" space. It's then left to LinkedIn to make sure your job catches the attention of the best candidates. It does this in two ways: first by giving your ad top billing on the LinkedIn homepage, and then by showing the ad in the potential candidate's email inbox. Employers can set how often ads appear in the top placement; they can even confirm a cost-per click, and limit how much they want to spend.**

### 5. Mingle with LinkedIn Groups

**The simplest way of building interest in your company and your current vacancies is by joining relevant LinkedIn groups. By interacting with like-minded folks in group discussions and Q&As on a regular basis, you can establish a LinkedIn presence for yourself and your company. That may be enough for inquisitive recruits to check out your company page.** ●

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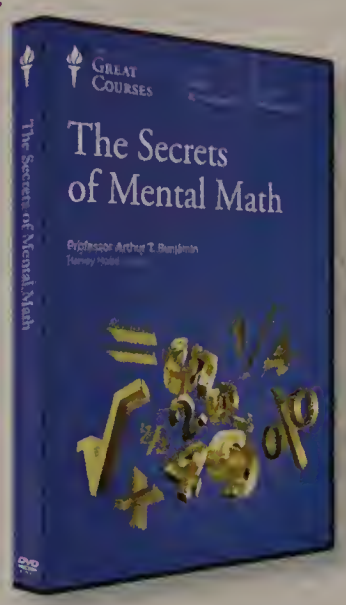


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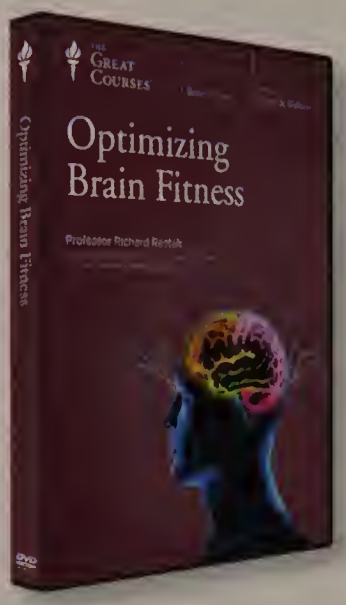


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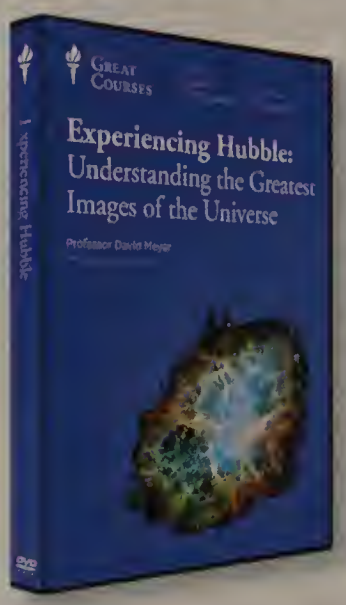


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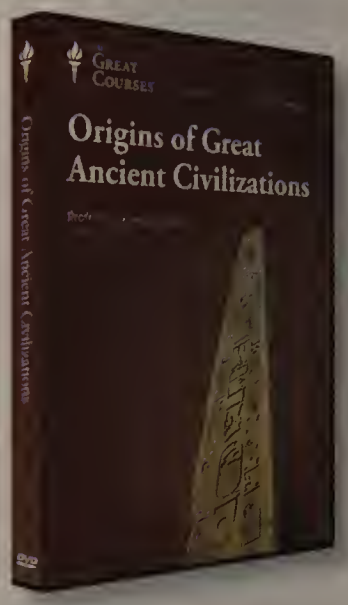


In **Origins of Great Ancient Civilizations**, Award-winning Professor Kenneth W. Harl gives you a fast-paced and fascinating introduction to the earliest and most influential civilizations of the Near East—including the Sumerians, the Persians, the Mesopotamians, the Egyptians, and more.

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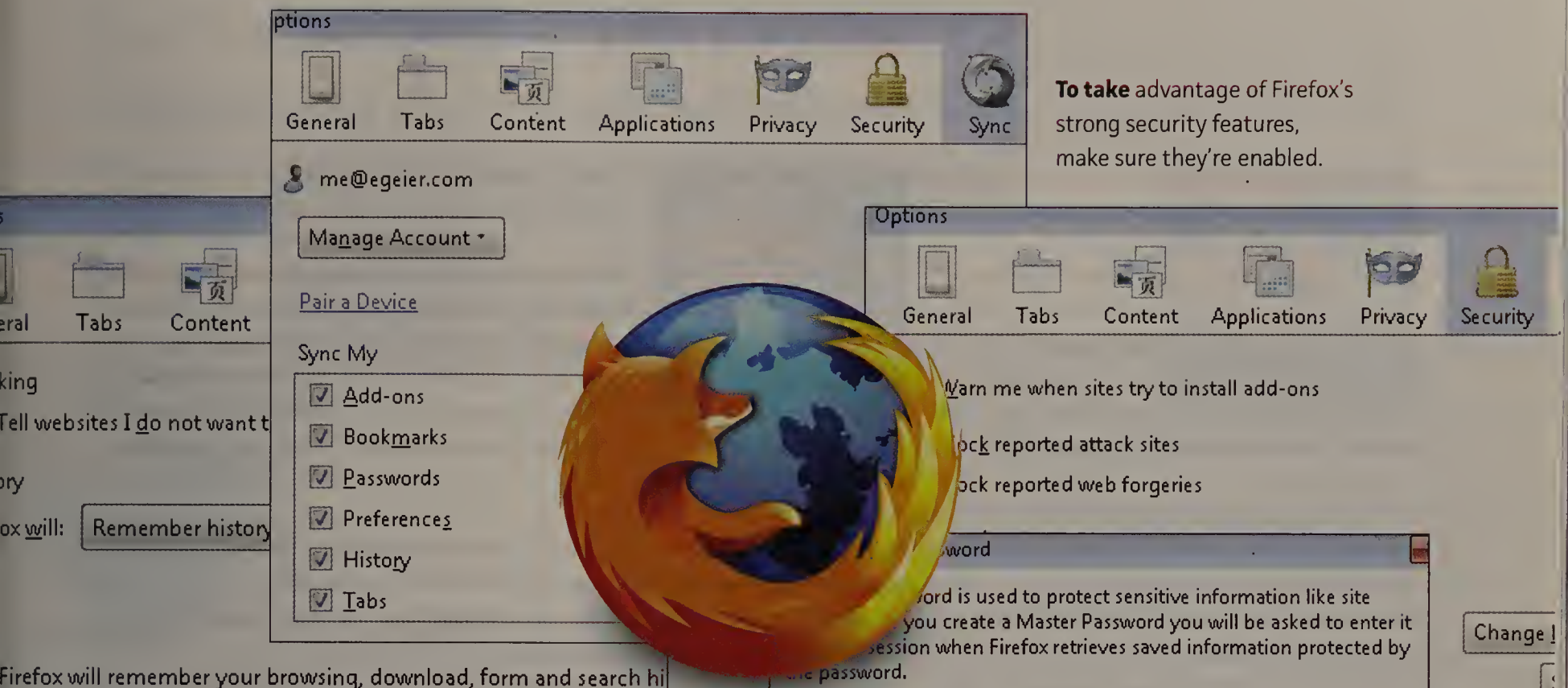
# Security Alert




**To take** advantage of Firefox's strong security features, make sure they're enabled.

# Five Steps to Firefox Security

## Fend off malware, phishers, and their ilk by exercising Firefox's built-in security features.

**BY ERIC GEIER**

MANY PEOPLE CONSIDER Mozilla Firefox to be one of the most secure Web browsers. But the amount of protection depends on the settings you have and haven't configured. Also, you can install countless add-ons to bolster your defenses.

### Enable a Master Password

As with Google Chrome, you can view a list of your saved usernames and passwords via the options menu of Firefox. If you employ the same or similar passwords for sensitive sites such as that of your bank, this list can be dangerous.

Fortunately, Firefox offers a master-password feature that encrypts and password-protects the saved-password list. When it's enabled, you must enter the master password the first time you use a saved password, once per browser session. Additionally, even though you enter the master password the first time, you must always enter it before you can view saved passwords via the options menu. This is a great feature to help prevent casual snooping around your passwords, and it even stops most third-party utilities from recovering them as well.

To enable the master-password feature, open the Firefox menu and select *Options* ▸ *Security* ▸ *Use a master password*.

### Use a Strong Password for Syncing

Firefox offers more security than Google Chrome does when you're setting up a new computer or device to sync. First you must log in with your Firefox Sync password, and then you either enter a random passcode from the new device into one that you've already set up, or take the recovery key from a device you've already set up and input it into the new device. Just be sure to use a strong password—one with mixed-case letters, numbers, and special characters. To enable or change sync settings, open the Firefox menu and select *Options* ▸ *Sync*.

### Enable Security Options

Like the other popular browsers, Firefox includes some basic security and privacy settings. Though most are enabled by default, you may want to ensure they haven't been disabled. »

Open the Firefox menu and select *Options*. In that window, select the *Security* tab. Confirm that the first option, *Warn me when sites try to install add-ons*, is enabled to help prevent sites from automatically installing add-ons, as some can be dangerous. The same goes for *Block reported attack sites* and *Block reported web forgeries*, options that can protect against malware and phishing.

Next, select the *Privacy* tab. For more privacy online, select the first option, *Tell websites I do not want to be tracked*, which isn't enabled by default.

Then, choose the *Content* tab. To prevent pop-ups, ensure that the *Block pop-up windows* option is enabled.

Last, select *Advanced* ▸ *Update* ▸ *Automatically install updates*.

## Use Add-ons for Protection

For additional safety consider installing some security-related add-ons (available from addons.mozilla.org):

**NoScript** helps you control which sites can use JavaScript, Silverlight, and Flash.

**Adblock Plus** blocks banners, pop-ups, and video advertisements on websites.

**Web of Trust (WOT)** shows the user ratings of sites and blocks malware and dangerous sites.

**HTTPS Finder** automatically detects and enforces HTTPS/SSL-encrypted connections when available, reducing the chances of an eavesdropper on a Wi-Fi network capturing your login details.

**Xpnd.it** is a short-URL expander that allows you to hover over shortened links to see the real URL.

## Check and Update Plug-ins

Cybercriminals regularly use vulnerabilities in popular browser plug-ins to infect and invade computers. Most plug-ins release updates to patch holes. Many automatically update or at least notify you of updates, but it's a good idea to periodically check for updates yourself. Consider using the Mozilla plug-in checker (go.pcworld.com/plugincheck).

**BUGS & FIXES**

# Mozilla Tackles an Odd Video Bug

JAMES MULROY

Plus: Adobe releases fixes for some of its most widely used products.

**In this month's haul of patches, Mozilla tackled not only run-of-the-mill memory corruption vulnerabilities but also a flaw that could allow attackers to infiltrate your system when you resize a playing video. In addition, Adobe issued updates for Flash Player, Reader, and Acrobat.**

## Firefox Flaws

**Mozilla's recent security advisories—three rated critical, four high, and one moderate—address weaknesses in Firefox and Thunderbird.**

**One advisory—rated critical—could let remote attackers execute arbitrary code through a so-called use-after-free vulnerability via events that occur when you resize a playing video. Such flaws crop up when memory is reallocated for another use but a program references it anyway, causing problems.**

**Another bug—rated moderate—can lead to information leakage. Attackers can combine it with other exploits that target the local file system, too.**

**These vulnerabilities are fixed in Firefox 21.0 and ESR 17.0.6, and Thunderbird 17.0.6 and ESR 17.0.6. To learn more about these problems and to update to the latest software, visit go.pcworld.com/mozsecurity, go.pcworld.com/mfsa46, and go.pcworld.com/mfsa43.**

## Flash Fixes

**A patch for versions of Adobe Flash Player for Windows, Mac, Linux, and Android corrects a number of memory corruption issues that could allow a hacker to take control of your computer or mobile device.**

**Adobe rates these flaws as Critical. Visit go.pcworld.com/adobe1314 for more details. To download the newest version of the software, head over to get.adobe.com/flashplayer.**

## Adobe Reader Rectified

**Adobe also issued a security update for Acrobat and Reader on Windows, Mac OS X, and Linux to correct flaws that could result in crashes or let a hacker take over your PC. This update addresses several Critical-rated memory bugs that affect Adobe Reader and Acrobat 11.0.2 or earlier on Windows and Mac OS X, and Reader 9.5.4 and earlier on Linux. Adobe has all the details—and tells you where you can go to download the appropriate patch for your operating system—at go.pcworld.com/adobe1315.**

ILLUSTRATIONS: GARY NEILL

# Twitter Security Feature: Ripe for Abuse?

TWITTER'S NEW two-factor authentication feature could be abused to lock users who don't have it enabled out of their accounts if attackers obtain their login credentials, researchers from Finnish antivirus vendor F-Secure say.

The feature, introduced in May, is an optional security measure intended to make it harder for attackers to hijack users' accounts. If enabled, the feature introduces a second authentication factor in the form of secret codes sent via SMS.

According to Sean Sullivan, a security advisor for F-Secure, attackers could abuse this feature to prolong unauthorized access to those accounts that don't have two-factor authentication enabled.

When the two-factor authentication option called 'Account Security' is first enabled on the account settings page, the site asks users if they successfully received a test message sent to their phone. Users can click 'yes' even if they didn't receive the message, Sullivan says.

Instead, Twitter should send a confirmation link to the email address associated with the account for the account owner to click in order to verify that two-factor authentication should be enabled, Sullivan says.

At the time of this writing, Twitter had not immediately responded to a request for comment regarding the issue that Sullivan describes.

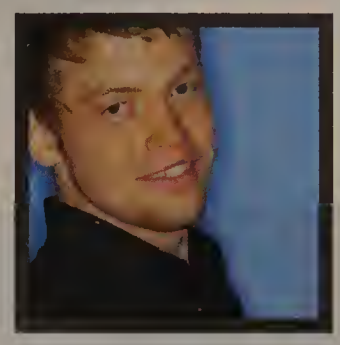
Twitter probably rushed to release this feature and didn't fully consider all of its aspects, Sullivan says, but he adds that this is likely only the first step; he believes the company will eventually have a solid implementation.—*Lucian Constantin*

PHOTOGRAPH: ROBERT CARDIN

## PRIVACY WATCH

# Freenet: Your Own Private Internet

Freenet lets you communicate and share data—anonymously.



ALEX WAWRO

**ANONYMOUS PEER-TO-PEER communication on the Net isn't just for privacy enthusiasts—it's critical for preserving free speech in the digital world. Anonymous file-sharing services are many but limited; if you want a highly anonymous peer-to-peer network with websites, forums, and more, look no farther than The Free Network, one of the best-kept secrets in anonymous communication.**

**Freenet is an anonymous peer-to-peer data-sharing network like BitTorrent, but it assigns all uploaded data a unique key, slices the data into small, encrypted chunks, and scatters it across different computers on the network.**

**When someone wants to access a piece of data—a document or photograph, say—they "fetch" it from the network using the unique key assigned to that piece of data. That fetch request is routed through intermediary network computers that don't store records of the request, ensuring that no single computer knows the contents of any one file.**

**This fetching system is very similar to how your Web browser fetches websites from the Internet. In fact, once you have the Freenet client running on your PC, you can use most commercial Web browsers to browse files and websites on Freenet. For optimal security, download the most recent version of a browser you don't normally use—say, Firefox or Chrome—and use it exclusively to browse Freenet with private browsing enabled.**

**Next, head over to the Freenet Project website (freenetproject.org) and download the Freenet client for your operating system. The installer will walk you through the setup procedure, with excellent explanations of your options.**

**You'll have to decide whether to use Freenet in friends-only (or darknet) mode for maximum privacy. This mode lets you connect to Freenet only through trusted friends with whom you exchange encryption keys, which makes it very difficult for anyone to track what you're doing. It also creates a traffic bottleneck that throttles your download speeds.**

**Once the Freenet client is up and running, you right-click the client icon in the Windows taskbar and select *Open Freenet* to access the welcome page. You'll quickly notice that I've only scratched the surface of what the network has to offer—Freenet is a complex and powerful tool for privacy enthusiasts, capable of scaling to meet your privacy needs. If you want to build a private Web of communication between a few trusted friends, or just want a way to share and consume content anonymously, Freenet can help you do that.**

# Reviews & Ratings

**The LG's** display offers great off-axis viewing.

**The AOC's** display is not as accurate as rival screens.

# Humongous Is Here: Three 29-Inch Displays

Go wide—really wide. With an aspect ratio of 21:9, these ultrawide displays will change the way you work.

**BY JAMES GALBRAITH**

WHEN YOU'RE multitasking, one monitor doesn't provide enough real estate to display every open window without many of them overlapping each other. But constantly rearranging multiple browser, chat, and photo-editing windows saps productivity and invites frustration.

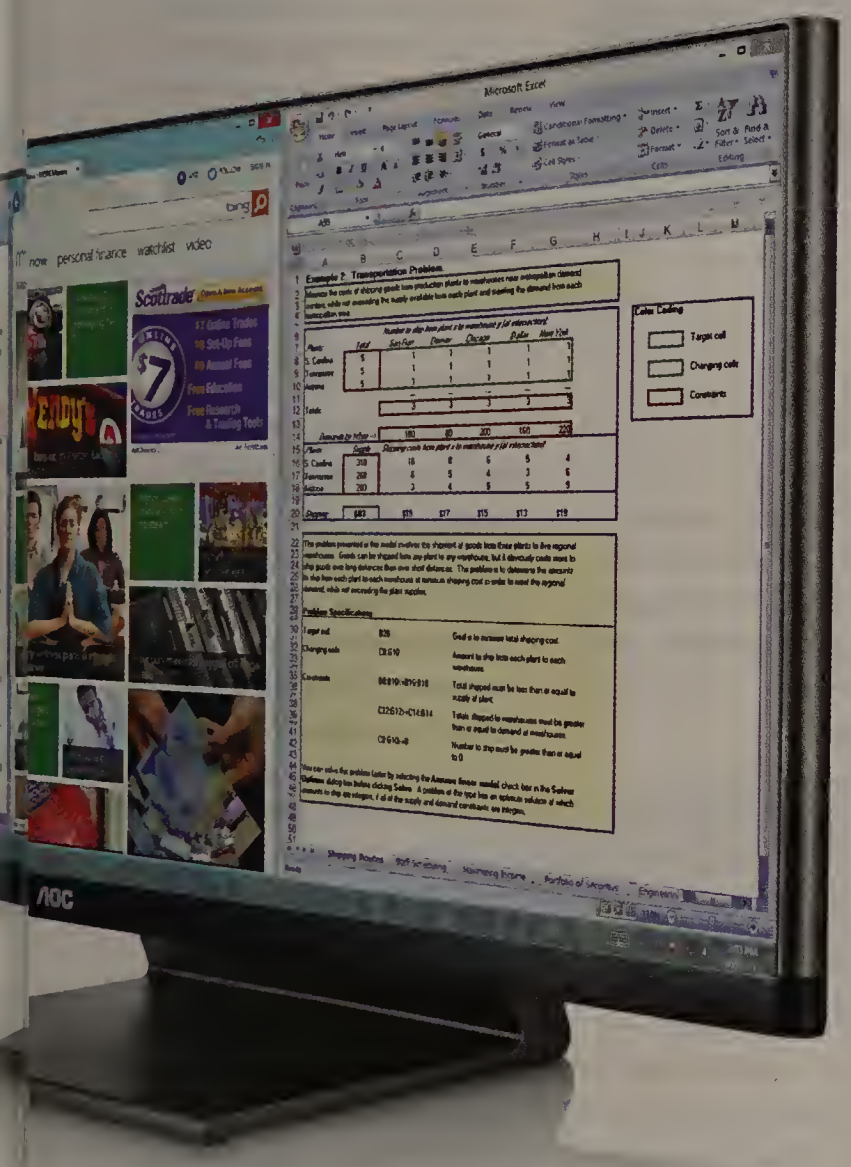
Regrettably, using multiple displays isn't a panacea. First, you need a graphics card that can support two displays. Second, multiple video and power cables add clutter. Third—and most important—a gap between the displays is inevitable. Even the narrowest bezel will create a blind spot as your pointer crosses from screen to screen.

That's why the new 29-inch, ultrawide displays are a welcome addition to the market. They're just the ticket for productivity apps, and they're not bad for gaming, either.

37 Toshiba Kirabook

44 V-Moda Crossfade M-80

45 Asus Cube




## The Contenders

Three such models recently passed through the PCWorld Labs: the AOC Q2963PM, the Dell UltraSharp U2913WM, and the LG 29EA93P Ultra-Wide IPS Monitor. Each of these monitors measures 29 inches diagonally, with an aspect ratio of 21:9. That's much wider than the 16:9 and 16:10 aspect ratios you'll find on more-conventional monitors. Each of them also incorporates a high-quality IPS (In-Plane Switching) LCD panel that delivers a very wide off-axis viewing angle. And each screen uses environmentally friendly LED backlighting, which reduces warm-up time and lowers energy costs. I liked all three displays, but one delivered more features and performed better than the other two.

## AOC Q2963PM

The AOC is one of the most full-featured displays in the group, providing DVI, HDMI, MHL, VGA, and DisplayPort options. MHL (Mobile High-Definition Link) gives you a means of mirroring the display on your Android tablet or smartphone. We found that the technology worked as advertised. The AOC monitor also supports DisplayPort 1.2 multistreaming, which allows you to chain several monitors together. Not every video card supports this feature, but I successfully tested it with an MSI GX60 gaming laptop. The AOC also includes the company's own Screen+ software, which permits you to divide the screen into multiple zones. Windows snap to a grid when dragged into a particular zone, and you can split the screen in half horizontally, vertically, or both, to make four rectangular zones for email, browsers, and more.

The AOC has stereo speakers, but they're poorly located on the left and right sides of the base, behind the center of the display. You'll be happier using even the most modest set of desktop speakers. The AOC's stand also permits little in the way of ergonomic adjustment.

The panel delivered crisp, clean text, and games and movies played smoothly; but it rendered stark whites with just a hint of yellow. You won't want to use this display for mission-critical color-accuracy tasks such as photo editing. ★★★½☆; $450 (lowest price); AOC; go.pcworld.com/aoc_ultrawide »

**Tested in PCWorld Labs**

**Products reviewed in this section—both hardware and software—have been tested by the editors. Hardware goes through a formal, rigorous testing procedure in our lab.**

**Dell's** display features a very flexible stand that tilts and swivels.

## Dell UltraSharp U2913WM

This monitor offers the greatest degree of ergonomic flexibility in this group, with several inches of height adjustment and a stand that both tilts and swivels. It also supports DisplayPort 1.2's daisy-chaining capabilities, and I had no problem getting that feature to work.

The monitor has all of the inputs you're likely to need: DisplayPort In, DisplayPort Out, Mini DisplayPort, Dual Link DVI, VGA, and HDMI. You will also find a handy USB 3.0 hub for connecting peripherals such as mice, keyboards, and external hard drives.

The U2913WM's IPS panel afforded great off-axis viewing, with very little color shift when my eyes moved left or right from the center of the screen. Colors were saturated and pleasing, once I figured out how to turn off the Autocolor feature that tries to optimize the screen settings according to the application being used. I found Autocolor to be a little freaky, to be honest. After looking at a test photo, I would click a browser window—and the whole screen would turn pinkish. I'd then tap back to Photoshop, and the colors would return to their prior values. On a display designed for multitaskers, having automatic color shifting turned on by default seems distinctly odd. On the positive side, text was easy to read, even at small type sizes, and movies and games played back smoothly.

Dell's Display Manager application, like AOC's Screen+, enables you to select zones that windows snap to as you drag them. The apps work reasonably well, but they take some getting used to. ★★★★ ; $600 (lowest price); Dell; go.pcworld.com/dell_ultrawide

## LG 29EA93P

The 29EA93P has the most stylish design of the three ultrawide displays. Though its thin black bezel looks similar to those on the AOC and Dell models from the front, the back of the case is white plastic and its edges and stand are chromelike. The stand is attractive enough, but it possesses a very limited range of motion, with only a few degrees of tilt. The speakers integrated beneath the front edge of the screen sound considerably better than the AOC's built-in speakers.

The 29EA93P provides multiple connection options, including dual-link DVI, two HDMI ports (one of which supports MHL mirroring of an Android device), VGA, and full-size DisplayPort. Unlike AOC and Dell, LG doesn't support DisplayPort 1.2 multi-streaming on this model.

Because it's an IPS panel, the 29EA93P provides generous off-axis viewing angles and exhibits very little in the way of color shift or loss of contrast. Video and games played well, colors were well saturated and pleasing, and text was quite easy to read. ★★★½ ; $699 (lowest price); LG; go.pcworld.com/lg_ultrawide

## Bottom Line

All three of these displays performed well, with wide viewing angles, good text legibility, and windows management features for taking advantage of the extrawide screens. For folks interested in using the extrawide screens to handle multimedia, the LG with its MHL support and adequate built-in speakers would be the best choice.

The Dell would be better for users who want to daisy-chain monitors or adjust the height and position of their displays without using risers. The AOC is a fine monitor, but its colors are somewhat lackluster in comparison to those on the other displays, and its speakers are just lousy.

**MORE ONLINE**

**For complete reviews of these three displays, see go.pcworld.com/ultrawide_displays.**

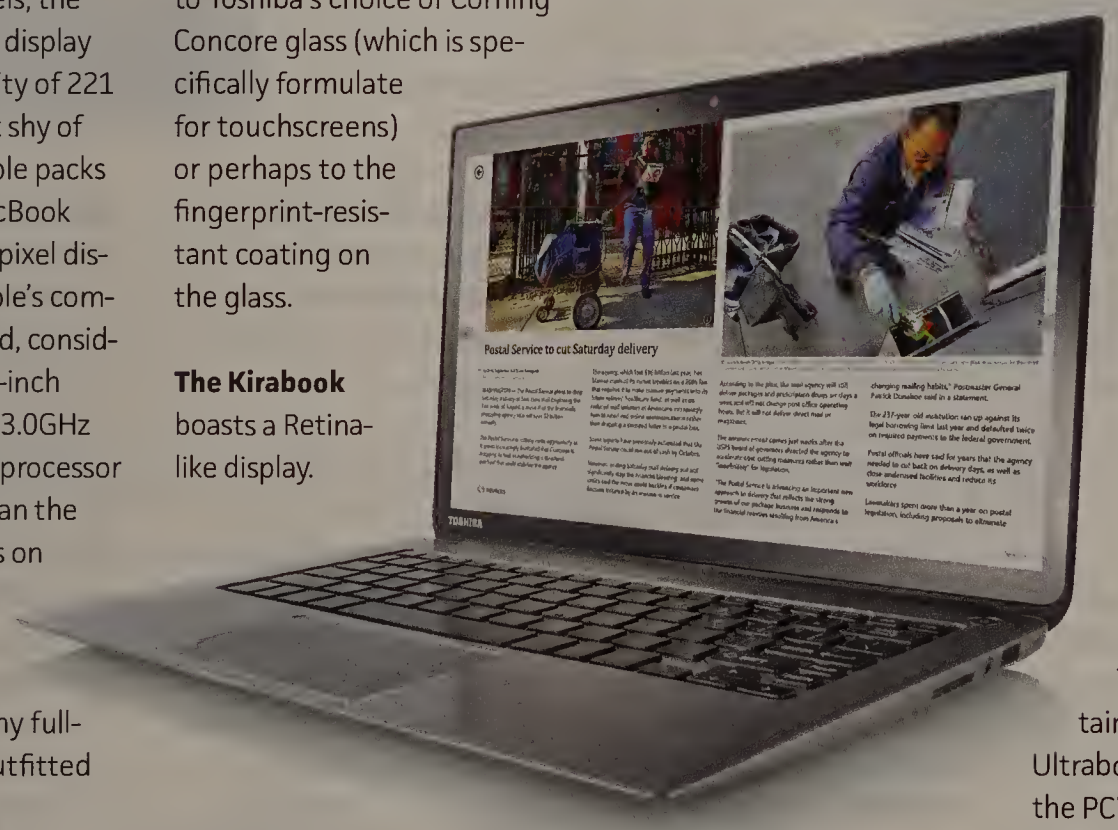
# Kirabook Features a Higher-than-HD Touchscreen

TOSHIBA'S luxurious Kirabook is the first Windows laptop to feature a display rivaling what Apple's Retina technology delivers. It's also thinner and much lighter than Apple's MacBook Pro, and it comes with a touchscreen. While I wish I could say that Toshiba has crafted a masterpiece that justifies its $2000 price tag, this machine suffers from a few significant flaws.

With a native resolution of 2560 by 1440 pixels, the Kirabook's 13.3-inch display delivers a pixel density of 221 pixels per inch—just shy of the 227 ppi that Apple packs into the 13-inch MacBook Pro's 2560-by-1600-pixel display. If you think Apple's computers are overpriced, consider the fact that a 13-inch MacBook Pro with a 3.0GHz Intel Core i7-3540M processor sells for $100 less than the Kirabook, which runs on a 2.0GHz Intel Core i7-3537U CPU. Apple, however, doesn't offer any full-blown computers outfitted with touchscreens.

Clock speeds aren't everything, of course. The processor that Toshiba picked for the Kirabook boasts a TDP (thermal design power) of just 17 watts, versus the 35-watt TDP of the chip that Apple uses. A lower TDP is desirable in a mobile computer, as it improves battery life. In our test, the Kirabook's battery lasted an impressive 5 hours, 14 minutes. The Kirabook's other key components include 8GB of DDR3-1600 memory and a 256GB solid-state drive.

Photos, movies, and documents look gorgeous on the Kirabook's display. But when I compared the Kirabook to a 13-inch MacBook Pro with Retina display, I found that Apple's laptop delivered far better contrast. Both rely on the Intel HD 4000 GPU core integrated into the CPU, so I don't know whether the Kirabook's weaker showing is due to Toshiba's choice of Corning Concore glass (which is specifically formulate for touchscreens) or perhaps to the fingerprint-resistant coating on the glass.




**The Kirabook** boasts a Retina-like display.

## No DisplayPort

Toshiba's touchscreen is very responsive; and since it supports ten touch points, it can accept all Windows 8 gestures. But Toshiba made a serious mistake in equipping the Kirabook with only an HDMI video output. If you connect it to a big-screen monitor, the maximum resolution you'll get is 1920 by 1080 pixels. Had the laptop's designers specified DisplayPort, the Kirabook would have been able to drive a 27-inch display at its truly impressive native resolution. Limiting the Kirabook to HDMI-out cripples it for desktop use.

## Mixed Bag

Toshiba is rightfully proud of the rigidity of the laptop's magnesium-alloy chassis, but the lid housing its display flexes enough to do the limbo. It feels alarmingly fragile. The other half, which encloses the keyboard and motherboard, feels very strong considering how thin it is. The machine weighs only 2.97 pounds. Its backlit keyboard offers very good tactile feedback, and its touchpad tracks smoothly.

The Kirabook also has three USB 3.0 ports, a media card reader, and a combination microphone/headphone jack. But it lacks a hardwired ethernet port. Exacerbating that problem is Toshiba's decision to employ Intel's Centrino Wireless-N 2230 Wi-Fi adapter, which is limited to networks operating on the crowded 2.4GHz frequency band.

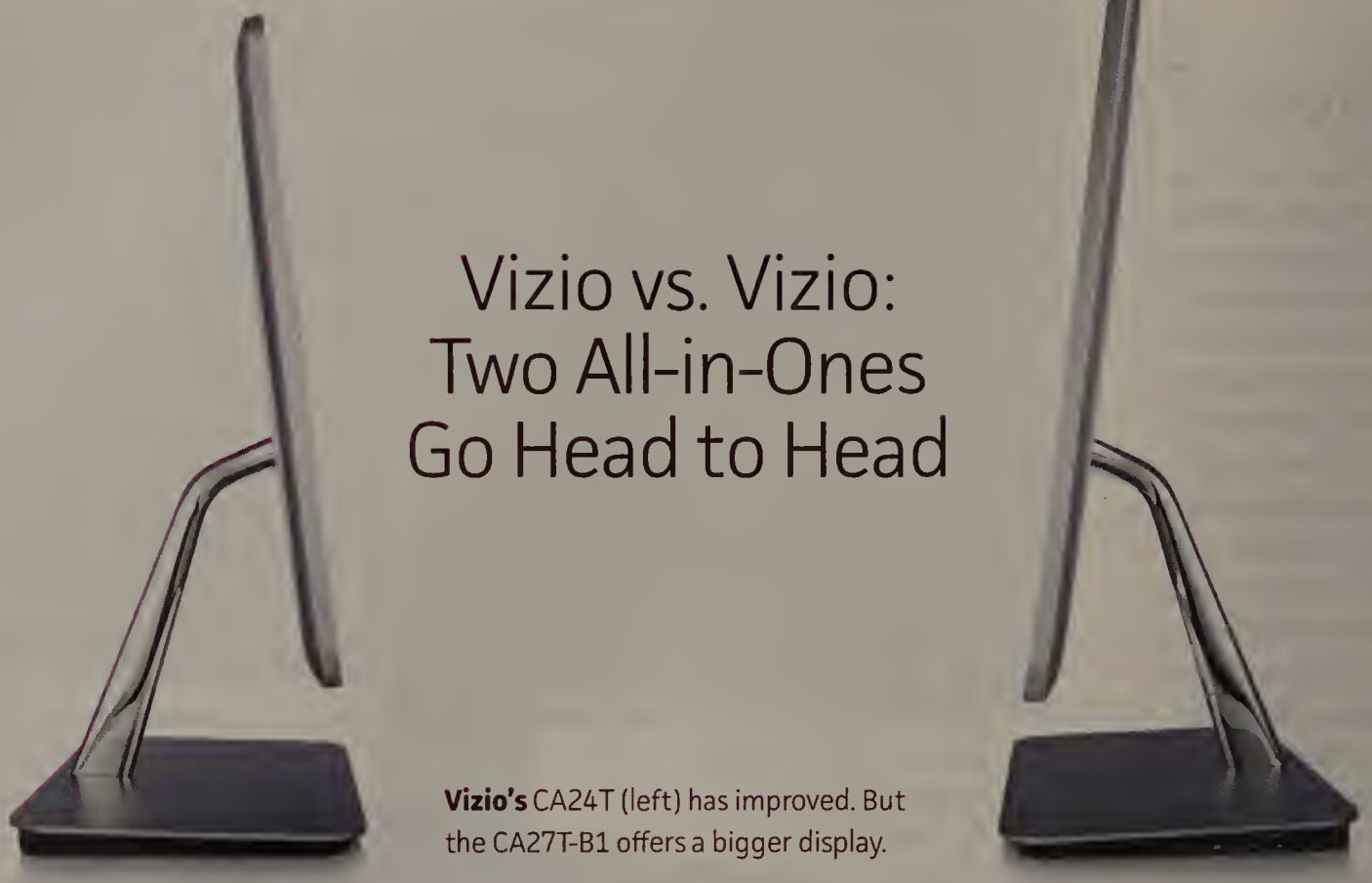
## Performance

The Kirabook achieved a Notebook WorldBench 8.1 score of 284, versus the 100-point score of our reference notebook, Asus's VivoBook S550CA. Much of that performance delta can be attributed to the Kirabook's solid-state drive. It also delivered better performance in most of the other tests that make up the WorldBench suite; however, those differences weren't nearly as dramatic as the storage performance results.

The Kirabook is certainly the most beautiful Ultrabook to pass through the PCWorld Labs, but the system's inability to drive a large external monitor at native resolution, a lid that flexes like a contortionist, a Wi-Fi adapter restricted to 2.4GHz networks, and a display that doesn't deliver as much contrast as the Retina display make this machine's sky-high price tag difficult to swallow.—*Michael Brown*

★★½; $2000 (lowest price); Toshiba; go.pcworld.com/kirabook

# Vizio vs. Vizio: Two All-in-Ones Go Head to Head



**Vizio's** CA24T (left) has improved. But the CA27T-B1 offers a bigger display.

VIZIO'S NEW VERSION of the CA24T all-in-one fixes the previous iteration's disappointing, TV-grade LCD. It's still pricey, however. The bigger CA27T-B1 has also improved, but drawbacks remain.

## 24-Inch CA24T

Whereas the prior version of the CA24T suffered from a blurry display, the new model's 1920-by-1080-pixel, 24-inch touchscreen delivers crisp text, renders movies well, and is nicely responsive to touch and gestures.

For its svelte design, Vizio had to use an external power supply, or APU. The company combined it with a subwoofer. The overall sound is clear, spacious, and amazingly loud.

The wireless keyboard and touchpad still put style over substance. The keyboard layout is cramped; the home or end keys are missing; and the nonsculpted, short-travel keys make typing harder.

We tested the $1280, low-end CA24T-B0 model. It has an AMD A10-4600M APU, 8GB of DDR-1333 memory, and a 5400-rpm, 1TB hard drive. The unit scored 75 on PCWorld's WorldBench 8.1 test suite—indicating that it is adequate for most chores.

The CA24T's cousin, the CA27T-B1, with a 27-inch display, scored 179 on WorldBench 8.1, more than twice as fast as the CA24T-B0. But the discrete AMD HD 8750A GPU in the CA24T-B0 handled games significantly better.

The CA24T doesn't skimp on connectivity. The ports are all on the base. Its right edge has the power button, a single USB 3.0 port, the headset jack, and an SD memory card slot. The back provides three more USB 3.0 ports, an eSATA port, a gigabit ethernet port, and the HDMI ports. It even has 802.11b/g/n Wi-Fi.

But we wish Vizio had supplied a better keyboard, plus mouse and SSD options. *—Jon L. Jacobi* ★★★☆☆; $1280; Vizio; go.pcworld.com/CA24T

## 27-Inch CA27T-B1

Vizio made a few improvements in this second-gen all-in-one, but the PC comes with the same poor peripherals.

Specs for the CA27T-B1 include Intel's mobile 2.4GHz Core i7-3630QM quad-core processor, 8GB of DDR/1600 memory, and a 1TB, 5400-rpm hard drive supplemented by a 32GB solid-state drive acting as cache.

The CA27T-B1's glossy 27-inch touchscreen is edge-to-edge glass with a native resolution of 1920 by 1080 pixels. The bezel is under the glass, and the panel's touch sensitivity extends just beyond the screen, so you can swipe in from the edge to open Windows 8's charm bar. Touch input is smooth and accurate.

Still, the screen is a bit disappointing: Colors looked a little washed out, with skin tones way off. HD streaming video had choppy artifacting.

The CA27T-B1 has several Bluetooth peripherals, including a keyboard, a trackpad, and a remote. The usability of both the keyboard and the touchpad is pretty awful.

The system has a great selection of ports (awkwardly placed on the rear of the base): four USB 3.0, two HDMI inputs, eSATA, a memory card reader, and gigabit ethernet, plus an integrated dual-band 802.11ac Wi-Fi adapter for your wireless network.

The CA27T-B1 is a solid all-in-one computer, but it would be a lot more exciting if it boasted a discrete GPU, a mouse, and an optical drive. *—Sarah Jacobsson Purewal* ★★★½☆; $1550; Vizio; go.pcworld.com/CA27T

PHOTOGRAPHS: ROBERT CARDIN

# Middling Performance Hinders Touchscreen VAIO

THE VAIO FIT 15 is certainly no Ultrabook, at 5.7 pounds sans power adapter, and it packs some beefy hardware: 8GB of DDR3/1600 memory, a 750GB hard drive, a DVD burner, and an HD touchscreen. Depending on configuration, prices range from $849 to $1699. Our review unit had a tag of $949.

With a native resolution of 1920 by 1080 pixels, the 15-inch display is bright. It also has a distractingly glossy finish, but its oleophobic coating keeps greasy fingerprints away, important on a touch-centric, Windows 8 system.

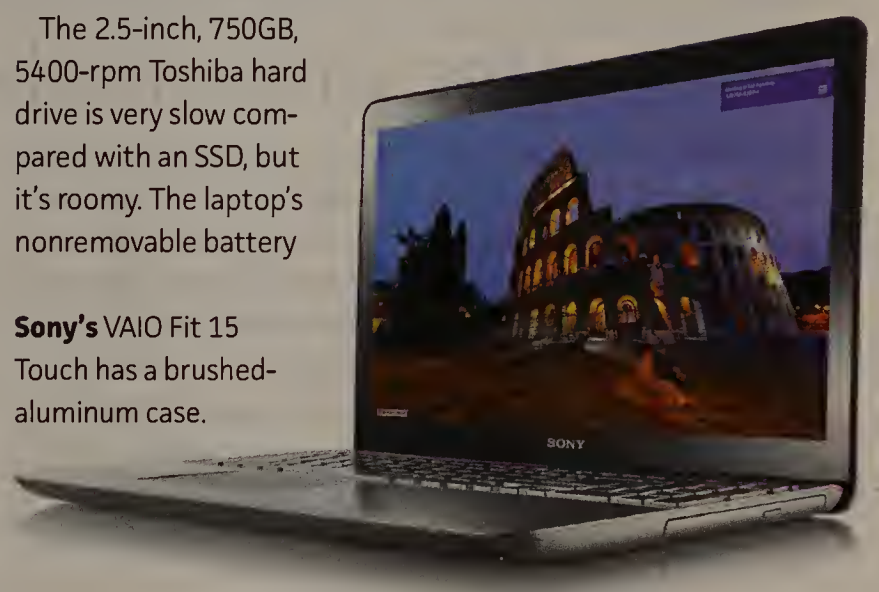
This model uses Intel's 1.8GHz i5-3337U (Ivy Bridge) processor. The integrated Intel HD Graphics 4000 GPU that drives the display delivered relatively poor gaming performance. The stereo speakers in the Fit's hinge generated plenty of volume, but little more.

The keyboard has Chiclet-style keys with a numeric keypad. The well-spaced keys are navigable by touch and offer a decent amount of travel, but feel mushy and soft.

The 2.5-by-4-inch touchpad is oddly placed, since it's off-center from the screen, but it's responsive. The touchscreen can recognize up to ten touches at once.

The Fit 15 is well connected, with a flip-out gigabit ethernet port; HDMI; two USB 3.0 ports (and one USB 2.0 port); a headphone socket; and an SDHC card reader. Although the laptop's Broadcom 802.11b/g/n wireless adapter permits you to connect only to 2.4GHz networks, it also supports the new Bluetooth 4.0 standard.

The 2.5-inch, 750GB, 5400-rpm Toshiba hard drive is very slow compared with an SSD, but it's roomy. The laptop's nonremovable battery kept it going for 3 hours, 8 minutes on one charge, far short of a full day's work. Performance was de-cent, with a Notebook WorldBench 8.1 mark of 158.—*Richard Baguley* ★★★☆☆; $949; Sony; go.pcworld.com/fit15




**Sony's** VAIO Fit 15 Touch has a brushed-aluminum case.

# The VivoBook S550CA: An Affordable Windows 8 PC

ATTRACTIVE LAPTOP models equipped with a touchscreen and running a full version of Windows 8 are getting more affordable. Asus's 15.6-inch VivoBook S550CA has a list price of $750—and you can find it for less online. With a full-size keyboard and an optical drive, plus that touchscreen, it's a pretty good deal.

The VivoBook S550CA is 0.86 inch thick and weighs 5.7 pounds. It has a 24GB SSD boot drive and a 500GB hard drive, and it starts up in just under 15 seconds.

**Asus's** new VivoBook runs the full Windows 8 OS.

Despite its thin profile, the S550CA accommodates a tray-loading Super-Multi DVD drive. It also hosts a couple of USB 2.0 ports, one USB 3.0 port, HDMI- and VGA-out, and a gigabit ethernet port, plus built-in 802.11b/g/n Wi-Fi and Bluetooth 4.0.

The touchscreen is responsive, accurate, and easy to use, but the shallow full-size keyboard makes quick, accurate typing almost impossible.

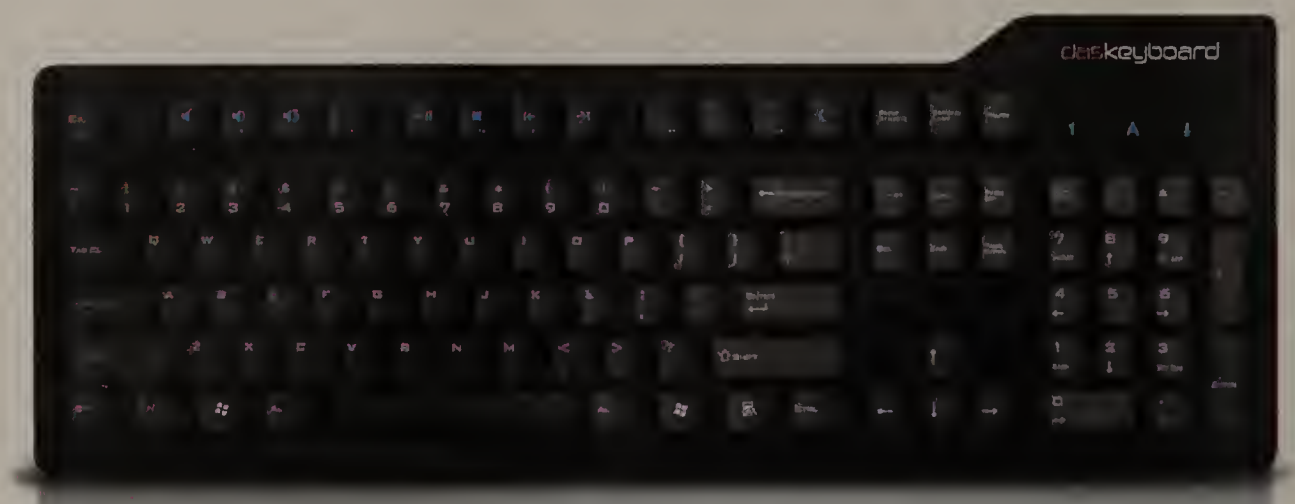
The S550CA performed well in our benchmark tests, thanks to its 1.7GHz Core i7 CPU and 6GB of DDR3 memory.

Video playback on the laptop was about as good as you can expect from a machine with integrated graphics and a low-resolution display (just 1366 by 768 pixels). Otherwise, the screen looks great.

Battery life is mediocre: It held out for just under 3.5 hours in our rundown tests.

Still, for many mainstream users, the S550CA is an okay computer for a great price. —*Sarah Jacobsson Purewal* ★★★☆☆; $750; Asus; go.pcworld.com/vivobookS

PHOTOGRAPHS: ROBERT CARDIN (TOP); MIKE HOMNICK (BOTTOM)




**Das Keyboard** Professional Model S Quiet lives up to its name.

# A Quiet Mechanical Keyboard

DAS KEYBOARD promotes the sound of its peripheral with an emphatic tagline: "The Mechanical Keyboard *That Clicks*." Now it's going after prospective buyers who crave the benefits of a mechanical keyboard but not the constant commotion that comes with it. Meet the Professional Model S Quiet: The quietest mechanical keyboard around.

In the beginning, keyboards were loud, mechanical, and everlasting. Soon a cheaper approach removed the click-clack in favor of plastic and a domed-shaped membrane.

Yet like all good things, the mechanical keyboard came back into favor among typing enthusiasts and gamers alike. And with the Das Professional Model S Quiet, you don't have to choose between having an awesome keyboard and not annoying your coworkers.

The keyboard uses Cherry MX Red key switches to keep the keyboard mechanical without being any louder than its squishier rivals. The keys themselves are smooth, concave, and perfectly spaced for comfortable, accurate typing. After using the keyboard for just a few days, I could feel the difference in my typing accuracy and speed.

Other basic features include media controls: You use the "function" key to adjust the volume, to pause/play, and to switch tracks. An instant "sleep" button puts your PC in rest mode quickly.

The keyboard feels great; it doesn't forgo any of the benefits a mechanical keyboard, yet it manages to keep its decibels significantly lower. If you're the kind of typist who is nostalgic for the clicky days of yore, you had best check out Das Keyboard's nonquiet models for the loudest keyboards around. If you like your peace and quiet, however, you'll love the investment in the Model S Quiet.

The Professional Model S Quiet keyboard is available through the Das Keyboard website for $149.

The keyboard takes up two USB ports, so you'll need to free up some USB real estate. Fear not, the company has a good excuse: One port powers the keyboard, while the other powers a combo of two USB 2.0 ports located on the right side of the keyboard, perfect for easily plugging in flash drives and phones.

—*Alex Cocilova* ★★★★½; $149; Das Keyboard; go.pcworld.com/daskeyboardS

# Seagate's Great, First Consumer-Oriented SSD

SEAGATE'S 600 solid-state drive is aimed squarely at a broad consumer base.

Available in both 7mm and 5mm profiles, it will fit in locations where drives must be thin. We evaluated the 7mm version (Seagate model number ST480HM000). The 5mm variant has Seagate's model number ST480HM001.

Seagate sent us a 480GB version of the 600 and a 400GB (enterprise-oriented) 600 Pro (model number ST400FP0021, available only in a 7mm height). Both drives have the same amount of NAND flash memory, but the Pro uses 80GB for correcting errors and replacing worn-out cells. This provides a longer life and safer operation in mission-critical roles. The review drives were physically identical 6-GBps SATA units with tamperproof cases.

The 600 proved upper crust in our testing. It wrote a 10GB mix of files and folders at 393.8 MBps, and it read them at 394.1 MBps. With large (10GB) files, those numbers jumped to 626.3 MBps writing and 467.8 MBps reading.

The 600 and the 600 Pro carry warranties stated alternatively in years and in data written, whichever comes first: three years or 72TB for the 600, and five years or 1020TB for the 600 Pro.

**Seagate's** 600 SSD.

At $410, the 480GB model costs approximately 85 cents per gigabyte.—*Jon L. Jacobi* ★★★★½; $410; Seagate; go.pcworld.com/sgate600

# Doxie One Simplifies On-the-Go Scanning

**The Doxie One** is sleek and ultraportable.

WE LIVE IN a digital age, but a lot of paper is still out there. Luckily, the Doxie One portable scanner ($149) provides a simple way to make digital copies of stacks of receipts, documents, recipes, and photos, and save them to a PC, Mac, or cloud service.

The Doxie One is also good-looking, sleek, and compact; and it's available in a rainbow palette of colors (black, pink, purple, green, yellow, red, orange, and blue). Measuring 10.5 by 1.7 by 2.2 inches and weighing just 13.6 ounces, the scanner will fit easily on just about any surface and won't add too much heft to a purse or messenger bag.

And it's designed to be used on-the-fly. It has an integrated SD card so you can scan and save documents even when you're away from the computer. You can even pop in four AA batteries (not included) for true portability.

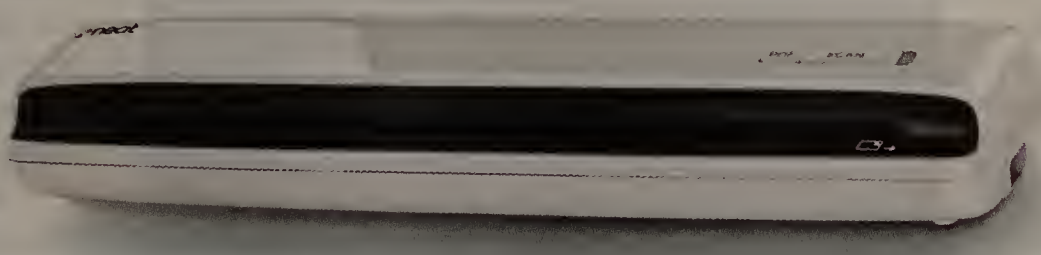
Alternatively, use the included AC cable, which has adapters for Australia, continental Europe, the United Kingdom, and the United States.

You also get a companion app that's essential for organizing scanned items and accessing your digital library from anywhere. The software lets you create searchable PDFs and sync to Evernote and Dropbox. Unfortunately, unlike Neat Receipts (see below), this software doesn't automatically organize data from documents, such as contacts from business cards or amounts and vendors from receipts, which makes it a less appropriate choice for business or tax purposes.

But the scanner and app are nicely designed and easy to use, so the system is very well suited to use for various personal purposes. And it can scan about five documents per minute, which is quite speedy. Because you'll have to feed items individually, the speed you achieve depends a bit on your manual dexterity. Image processing is also very quick once you've connected the scanner to your computer via USB.—*Jasmine France*

★★★½☆; $149; Apparent; go.pcworld.com/doxieone

# NeatReceipts Scanner Makes Filing a Snap



**NeatReceipts** offers a compact scanner—and nifty software.

CYBERLINK'S $150 NeatReceipts digital filing system may not be magic, but using it is much easier than entering the data on business cards and receipts manually. The package includes a portable scanner and some nifty software for extracting and organizing data from your business documents. It's a handy tool for both individuals and small businesses.

At 10.8 by 1.6 by 1.3 inches and 10.6 ounces, the NeatReceipts scanner will fit easily on any desk and won't weigh you down when you're carrying it. Setup is a simple matter: Install the software and plug the unit into your computer's USB port—it's the only connection necessary for both power and data transmission.

You have to scan items one at a time, and the process is a bit slow. The company promises three to four receipts per minute, but I found that the rate is more like 1.5 items per minute. Still, it's faster and easier than inputting by hand.

The software did a good job of organizing the information from the paper documents. Business cards are saved as digital contacts; receipts become records of vendors and amounts, which will be useful when tax time rolls around.

With receipts containing multiple totals, such as those for a restaurant with pre- and post-tip fields, NeatReceipts sometimes saved the wrong value, but you can edit in the app easily enough. This minor annoyance is erased by handy tools for creating tax and expense reports, and by the option to export data to Quicken, Excel, or TurboTax. You can also sync contacts with Outlook or your address book.

NeatReceipts comes with a 30-day trial of NeatCloud, which backs up all of this data and lets you access it from anywhere. Beyond that period, a subscription costs anywhere from $6 to $25 per month.—*Jasmine France*

★★★½☆; $150; CyberLink; go.pcworld.com/neatreceipts

# Sony's Xperia ZL: A Solid but Unexciting Phone

THE SONY XPERIA ZL ($759, unlocked) ticks all the right boxes for a high-end Android smartphone: large, full-HD display; 13-megapixel camera; speedy LTE-connectivity; and beefy quad-core Snapdragon processor. But nothing about it says "You must buy me now."

## A Pretty Face

The Xperia ZL's 5-inch 1080p display is gorgeous if you look at it dead on, but it begins to look washed out as you tilt the phone away. If you like to show off photos to your friends or watch videos on a bus ride, keeping tabs on how you hold the phone can be annoying.

The screen's bezel is wondrously thin, and the 443-ppi pixel density delivers clear, crisp text and bright, vivid images. The ZL even lets you adjust the color temperature via white balance settings.

The phone is fairly wide—just shy of 2.5 inches—but I found it comfortable to hold (I have large hands). The headphone jack sits by itself at the top of the phone, meanwhile, the Micro-USB charging port sits on the left. The right side of the phone hosts a volume bar, a power button, and the shutter button for the camera. The ZL weighs 5.35 ounces, and measures less than 0.5 inch thick, so it's an agreeably pocketable package.

The phone's single speaker sounds bassless and tinny at high volume, but it's on the rear, so it stays out of the way however you hold the device.

The camera captures lovely photos when fed lots of light and when you take the time to compose a great shot. Sony provides a dedicated camera shutter button, but to launch the camera app you have to use the lock screen, which can take a second or two.

Autofocus is another problem area: Tapping the phone's screen while composing an image tells the phone the general area you want to focus on, but it doesn't focus until you press the shutter button on screen. You can instead press the dedicated shutter button halfway, and then take the shot; but when I tried this method, several of my photos looked rather blurry because I was too quick on the draw.

The ZL offers 1080p video recording—with excellent audio recording—but the camera's image stabilization occasionally made my videos jittery when I panned about.

## Some Staying Power

The Xperia ZL's 1.5GHz quad-core Snapdragon S4 Pro processor and 2GB of RAM enabled it to effortlessly handle every app and game I threw at it. Call quality on AT&T's network in San Francisco was excellent at both ends.

**The Xperia ZL** has a superb 5-inch display.

The ZL's 16GB capacity, its support for 32GB MicroSD cards, and its NFC, Wi-Fi, and Bluetooth radios are standard for a modern smartphone. If you own any of several models of Sony TVs, you can use the phone as a remote control. The ZL's 2370 mAh battery isn't removable, but I rarely needed to reach for a charger until the end of a day's worth of Web browsing and email syncing. The battery buckled faster when I cranked up the brightness and spent a few hours viewing videos, playing games, and streaming music.

One of the phone's neatest tricks is Stamina mode. Turn this feature on, and the phone will automatically disable mobile data and Wi-Fi every time the screen turns off. You'll still receive calls and text messages, downloads and uploads will complete, and certain apps (like music streaming over Spotify) will continue to work in the background. You can also set up a whitelist of apps that will ignore Stamina mode and function normally. Sony claims that this setting will quadruple the phone's standby time.

The Xperia ZL runs Android 4.1 (Jelly Bean) with a few understated embellishments. Simple animations breathe life into mundane actions like dragging icons about, the multitasking overview adds a few application shortcuts, and you can quickly uninstall apps with iOS-style X's.

The Xperia ZL performs well, has lots of battery life for normal use, and even has a nice (albeit limited) camera. But with so many great smartphone alternatives available, I'd buy elsewhere.—*Nate Ralph*

★★★½☆; $769; Sony; go.pcworld.com/xperiazl

# BlackBerry Targets Keyboard Enthusiasts

**The BlackBerry** Q10 carries a 3.1-inch screen.

BLACKBERRY'S SOLIDLY built Q10 smartphone will please people who've longed for a new physical-keyboard BlackBerry, but its small screen and limited app support will discourage others.

The Q10's screen is incredibly sharp and responsive, but it measures a mere 3.1 inches. As a result, browsing anything besides text is a bit claustrophobic: Videos are minuscule, and webpages without dedicated mobile sites are a chore to navigate. You can zoom, but the narrow screen requires constant horizontal scrolling to see anything. And the Q10 has no landscape mode to help you.

The Q10 lacks a dedicated home button; to exit an app, you swipe up from the bottom of the screen. But I repeatedly exited apps unintentionally when the system misinterpreted my attempts to scroll as cues to return to the home screen.

The biggest problem for the Q10 is apps: Not only are suitable apps fairly rare, but developers have to create specialized versions to suit the screen's squarish shape.

The Q10's built-in browser is better than the one on previous models, but it still underperforms in the SunSpider JavaScript benchmark (1.69 seconds) and the Peacekeeper HTML5 test (a mark of 379).

Of course, for most people contemplating the Q10, the crucial thing is to get hold of a phone that comes with a good physical keyboard. The Q10 delivers on that score, and these days very few rival smartphones meet the same criterion.—*Hayden Dingman*

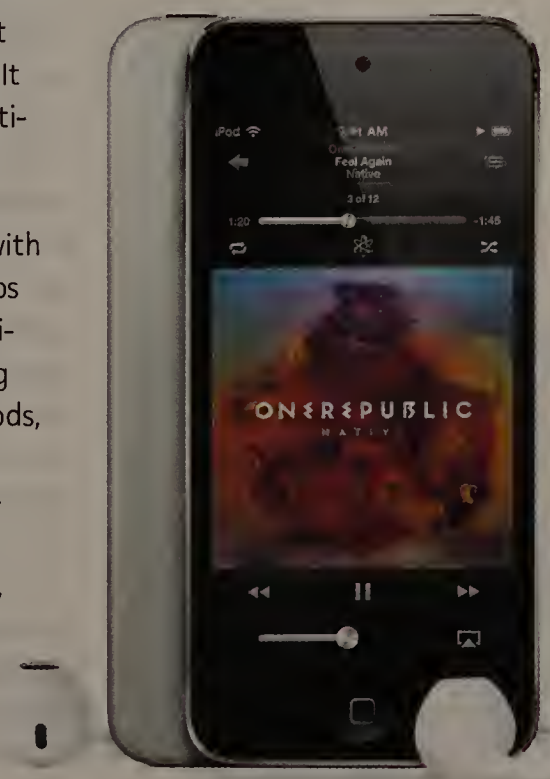
★★★½☆; $250; BlackBerry

go.pcworld.com/q10

# New 16GB iPod Touch Lacks a Rear-Facing Camera

IN MOST WAYS, the $229 16GB fifth-generation iPod touch is identical to the $299 32GB and $399 64GB fifth-generation models that Apple released last fall. It has the same 4-inch Retina display, dual-core A5 processor, front-facing FaceTime HD camera (with its 1.2-megapixel photos and 720p video capabilities), bundled Lightning cable, remoteless EarPods, and overall dimensions. However, it lacks a rear-facing iSight camera, a strap post (and a strap), and a choice of colors (it comes only with a black face and a silver back).

Given that the 16GB iPod touch has no new or improved capabilities over its higher-capacity siblings, your buying choice comes down to differences in price, storage space, and camera capabilities.




**The latest** 16GB iPod Touch has a black face and a silver back.

The storage capacity you need depends on how you intend to use the device. If you plan to stream—rather than store—a lot of media and don't play demanding games, 16GB may meet your needs perfectly. If you are more of a "carry it all with you all the time" person, a 32GB or 64GB model will be a better match.

Then there's the lack of a rear-facing camera. The iPod touch's front-facing camera is great for FaceTime and for "selfies," but being limited to that single camera is bound to put a serious dent in your Instagram, YouTube, and Facebook lives.

We increasingly share videos and images over social networking services, and that requires a camera that lets you frame your subjects. A front-facing camera doesn't allow that—unless you're the kind of social networker who shares pictures and videos of yourself almost exclusively. —*Christopher Breen*

★★★★½; $229; Apple; go.pcworld.com/16gbtouch5

PHOTOGRAPH: (TOP) MICHAEL HOMNICK

# Industrial-Strength Audio

**The M-80's** three-button inline remote.

V-MODA'S CROSSFADE M-80 headphones sport a metal, plastic, and cloth design that looks angular, industrial, and edgy. The M-80 is available in shadow (black/dark gray) and pearl (white/light gray) color schemes. You can customize the outside of each earpiece with interchangeable "shield" faceplates that are available in various of colors, with optional text or logos (including the option to submit a custom logo). You get another pair of shields free if you purchase the M-80 directly from V-Moda, or you can purchase them later for $25 per pair.

V-Moda bundles a couple of cloth-wrapped and Kevlar-reinforced cables in the package: Each has an inline microphone, but one features an Apple-style three-button inline remote and a microphone, while the other uses a one-button inline remote for use with non-Apple devices.

The current version of the M-80 (v2) separates the microphone from the remote module, positioning the microphone higher—and closer to your mouth—with the remote lower on the cable to make it easier to see and use. Either cable attaches to the left earpiece via a 3.5mm miniplug.

Included with the sturdy M-80 is a hard-plastic "Exoskeleton" case whose design suggests a Klingon forehead or the bony torso of Ridley Scott's Alien. Although the M-80's earpads don't feel luxurious, I found them quite comfortable to wear. Their metal construction enables you to bend the headphones a bit to improve comfort.

For sealed headphones, the M-80 delivers tight bass that doesn't interfere with the impressive midrange and treble frequencies. The headphone's inline mic is fine for occasional phone calls, but in my tests it sounded rather distant.—*R. Matthew Ward*

★★★★½; $200; V-Moda; go.pcworld.com/hphones

**B&W's P3** comes in blue, black, and white versions.

# B&W P3 Headphones Are Weakest in the Midrange

BOWERS & Wilkins's $200 P3 is made of attractive cloth and rubberized plastic in blue, black, or white, with chrome and brushed-metal highlights, removable magnetic earpads, and a removable cable with three-button remote and microphone.

Each cable plug is hidden behind the earpieces, and the cable is wound inside to provide strain relief. You also get a rigid clamshell carrying case and a two-year warranty.

The earpads are soft and comfortable. Instead of using a single cable attached to the left earpiece, the P3 relies on a split cable that attaches to both earpieces (via mono 2.5mm plugs)—a somewhat messier arrangement.

The P3's earpieces don't swivel much, which makes them a bit less comfortable than they otherwise might be. Like other B&W models, the P3's remote and microphone module is perfectly cylindrical except for a depression that indicates the location of the center button. This design makes the center button easy to press; however, it also makes determining where the front of the volume up and down buttons are—and pressing them accurately—more difficult.

The P3's treble frequencies are fairly strong, but the bass is excessive and a little sloppy, and in my audio tests it tended to overwhelm the midrange frequencies, which are recessed relative to both the low and the high frequencies. Ultimately, despite the P3's positive qualities, I found listening to it for long periods of time to be somewhat fatiguing.—*R. Matthew Ward*

★★★½; $200; B&W; go.pcworld.com/hphones

# Asus Cube: A Capable but Flawed Set-Top Box

THE $140 ASUS Cube is a set-top box that functions as a media streamer, advanced program guide, and application bundle for Google TV. But in my tests, its features weren't always easy to use.

Measuring about 5 inches on each side and weighing less than 15 ounces, the Cube sits between your TV video source—typically, a cable or satellite box—and your HDTV, with HDMI cables making the connections both ways.

Besides its HDMI-in and -out ports, the Cube has an ethernet port for connecting to a broadband network, an IR blaster port (and cable) for transmitting commands from its remote.to the cable or satellite box, and two USB 2.0 ports for hooking up media-content drives for playback.

The Cube only supports 10/100 ethernet, and if you can't use a wired network connection, you're limited to 802.11n Wi-Fi on the often-crowded 2.4GHz band.

The Cube's somewhat thick candy-bar remote combines fairly standard navigation and playback buttons on one side and a QWERTY keyboard on the other, as well as a hybrid touch-sensitive and mechanical navigation pad, support for voice searches, and a dedicated Netflix button.

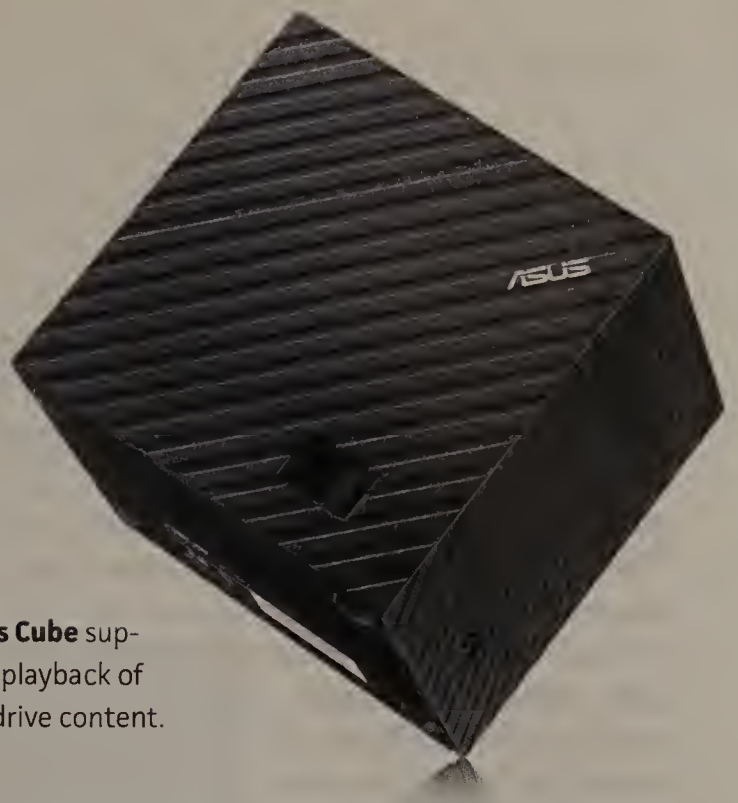
To initiate a voice search, you press one of the remote's two microphone buttons—one is on the navigation side of the remote; the other, on the remote's bottom edge when you're holding it for typing on the keyboard. But the button on the edge is too easy to press inadvertently when you're using the navigation side of the remote.

The touch-mechanical keypad, which takes up about the top third of the remote in navigation (portrait) mode, is both sensitive and responsive.

You can download Google Play store apps to the Cube's 4GB of internal memory, and Asus offers access to 50GB of free cloud storage via a preinstalled Asus WebStorage app. A downloadable app lets your Android phone or tablet access Cube content and apps.

Also preinstalled is a full-featured version of the Chrome browser, so you can browse the Web on your TV. You first activate the cursor, using the cursor key that's next to the microphone key on the bottom edge, after which the navigation touchpad functions like a regular touchpad.—*Yardena Arar*

★★★½☆; $140; Asus
go.pcworld.com/asuscube




**Asus's Cube** supports playback of USB-drive content.

# Plair Plays Web Content on Your TV

THE $99 PLAIR video streaming stick targets users who run a 20-foot HDMI cable from their laptop on the couch to the back of their HDTV.

Using a Chrome plug-in, you can "send" your TV video content by choosing it from the browser on a Mac running OS X 10.6 or later, or on a Windows PC running XP or later. In effect, you're telling a particular website to send the content directly to the Plair. (The company actually uses the word *beam*, but that isn't really right either.) You also get more-limited functionality from mobile devices running iOS 4.2 or later and Android 2.3 or later, and support for streaming videos and photos directly from your computer or mobile device.

The Plair is an interesting concept, but in its current form it's too buggy for prime time. When it worked, it was pretty cool. But unfortunately it was hit or miss. I understand that the company is going after a less tech-savvy person than your typical set-top box user; but for most people, the same money would be better spent on an Apple TV or on a Roku 3.—*Jonathan Seff*

★★½☆☆; $99; Plair Media;
go.pcworld.com/plair

PHOTOGRAPH: (BOTTOM) JASON CROSS

# Corel VideoStudio X6 Eases Video Production

**VideoStudio** X6 has an intuitive interface, with a timeline.

DOWNLOAD THE LATEST VERSION of Corel VideoStudio adds a slew of new features to bring the super-intuitive video editor and producer into a virtual dead heat with competing programs. New tricks in its bag include animation overlays, the ability to control DSLR cameras for stop-motion animation, free-form motion editing, layer swapping, motion tracking, support for 2K and 4K video, and more. One cool new feature for subtitling is a form of audio beat detection that allows you to sync subtitles to speech more easily.

Several sensible design decisions make version X6's interface friendlier and easier to use than just about anything out there. A nice, simple storyboard view makes adding and arranging items more intuitive. Once you've introduced your items, you can use the timeline to tweak their location and lengths, and add audio, multitracking, subtitles, and the like.

VideoStudio X6 includes a ton of transitions, effects, title styles, and what Corel calls *instant projects*—basically templates. You drag an instant-project element to your project, and then edit details such as colors, text, and the video and audio to be used.

The Pro version costs $60, but the $100 Ultimate version adds a boatload of nice effects from NewBlue and proDAD, plus proDAD's great video stabilization. Ultimate X6 is worth the extra $40, especially if you edit home video that need steadying.—*Jon L. Jacobi*

★★★★½; $100 (Ultimate); Corel; go.pcworld.com/vsx6

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# Last Light: Fun in Post-Apocalyptic Russia

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FOLLOWING IN THE footsteps of 2010's Metro 2033, Metro: Last Light improves on the gameplay of its predecessor without ruining what made the series great: the setting. Last Light takes you back to the desolate, post-apocalyptic Russian wasteland of Metro 2033 to deliver a first-person shooter of great pathos and narrative power, with a terrific score.

Boot up Last Light, and you are dropped into the boots of Artyom, a man haunted by memories of his mother as he attempts to leave the Russian Metro to capture a mutant Dark One who survived a massive missile strike at the end of Metro 2033. Along the way, you will be captured and will orchestrate an escape with other survivors. Your quest leads you through devastated areas and nests of enemies mutated by the apocalypse, and culminates in one of the most intense firefight finales I've ever experienced.

**Last Light's** soldiers must rely on pre-apocalyptic weaponry.

Unfortunately, myriad bugs, including crashes and freezes, disrupt the atmosphere and pacing. The game suffers from a lack of direction, too. And the gameplay is *hard*—even the Normal setting is tough.

But despite its flaws and poor guidance, Last Light does more with its narrative than some feature films do.

—*Alex Rubens* ★★★★½; $60; 4A Games; go.pcworld.com/lastlight


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# Fix It Fast!

## Facing a Windows, hardware, software, network, Internet, or mobile-device crisis? **Here's how to take quick corrective action.** »

BY PCWORLD STAFF
ILLUSTRATIONS BY ANDY POTTS

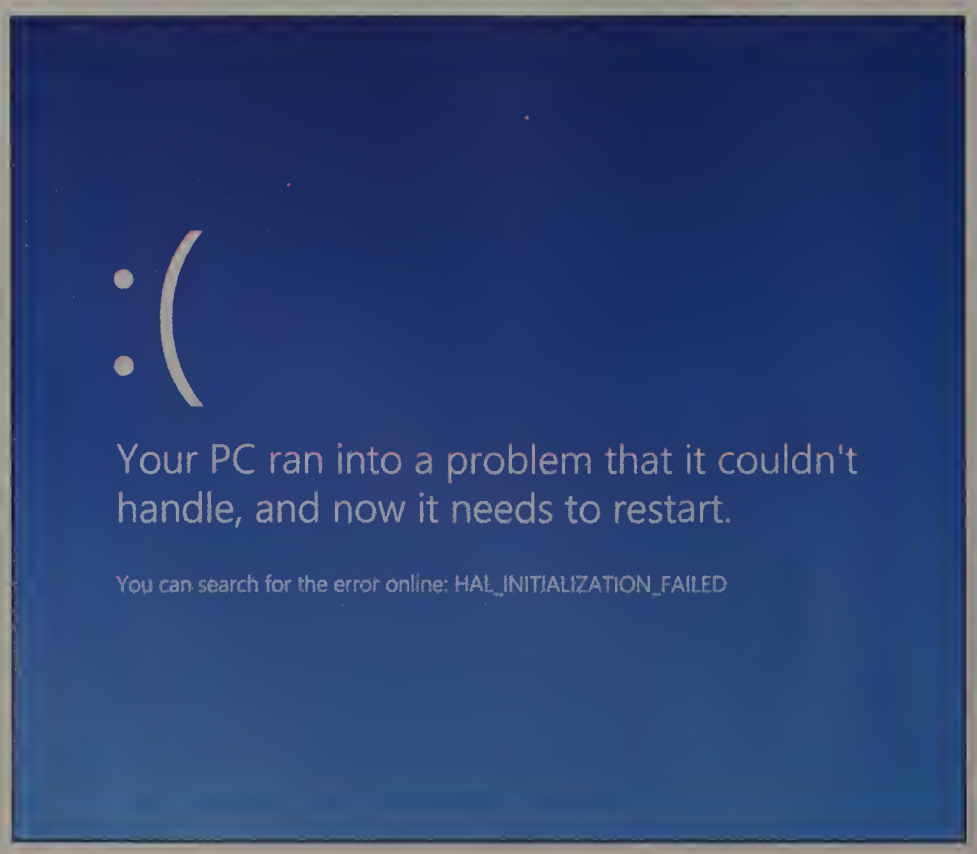
# Your PC is a machine of many talents.

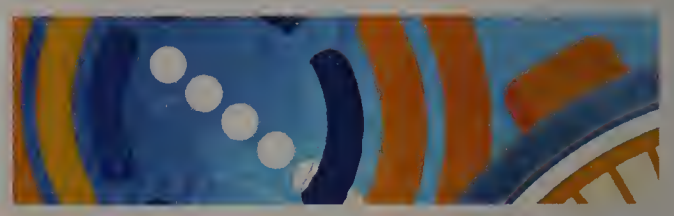
It can serve as a photo editor, a gaming machine, a workspace, and a home cinema. But sometimes something in your system fails just when you need it most.

Whether you're dealing with a dead monitor, a corrupt Windows installation, or a new operating system, you can solve many common PC headaches in a flash once you know where to look. To that end, we've collected a few of our favorite quick fixes for the hardware, software, and services you use.

With these tricks, you won't just be better prepared to fix an ailing system—you'll be able to tweak your PC to work stronger, faster, and better than before.

**Blue Screen of Death:**
Frequent sudden system shutdowns are a sign that your PC is battling a heat problem.



# Quick PC Fixes

## End Spontaneous System Shutdowns

**5 minutes:** If your PC regularly shuts down or restarts itself without any logical explanation, and if you don't see any other signs of trouble—such as error messages, a blue screen of death, or graphical glitches suggesting that your GPU might be giving up the ghost—you probably have a heat problem on your hands.

The simplest way to cool things down is to open your PC's case and gently brush out any accumulated dust, dirt, or other debris. If you built the PC yourself and still have some thermal paste lying around, it's a good idea to clean the old thermal paste off your CPU and reapply a fresh coat (see "Use Thermal Paste to Fix a Too-Hot CPU," page 52).

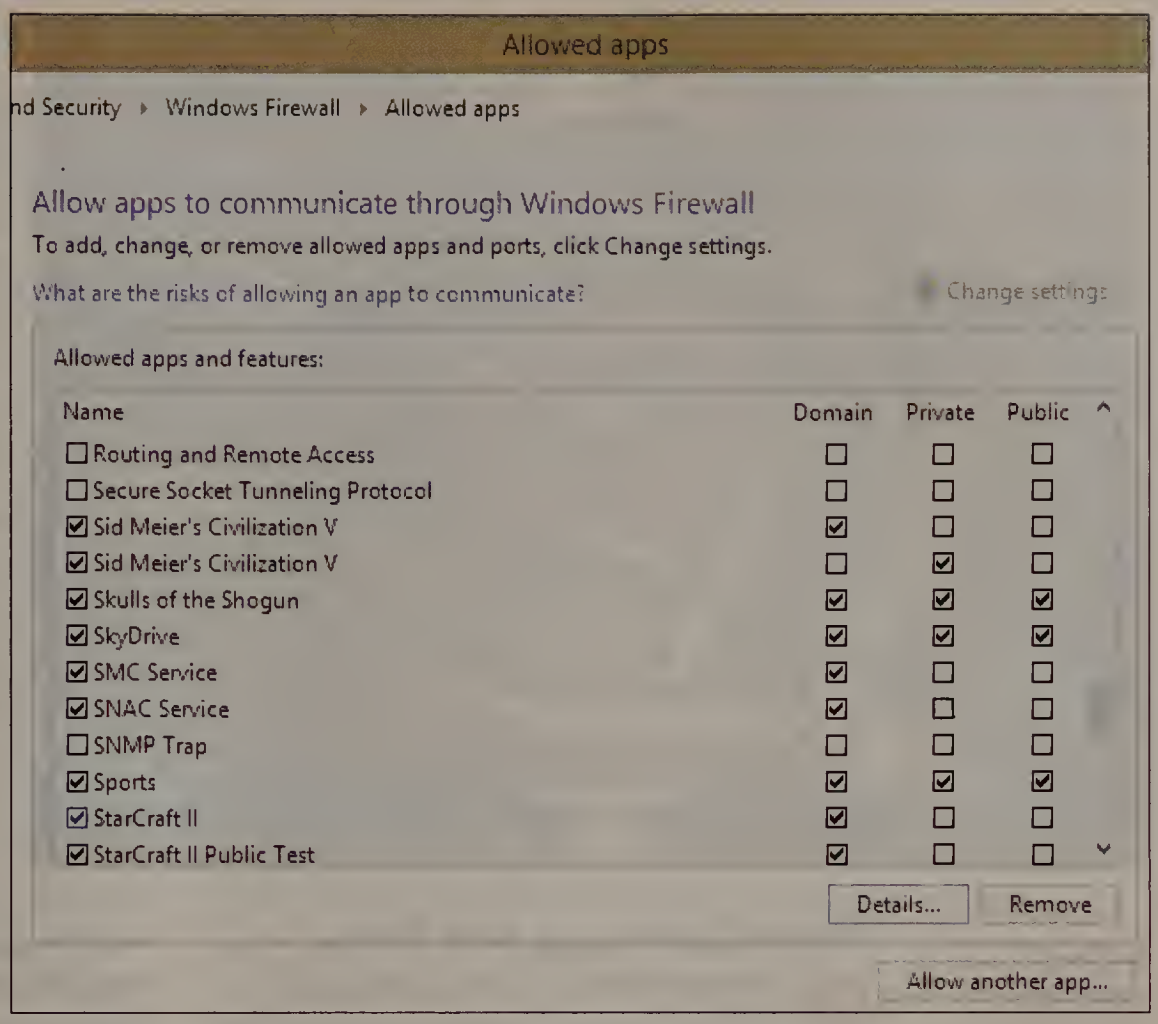
If that operation doesn't solve the problem, the underlying difficulty may be that your power supply isn't delivering enough juice to keep your PC running under the pressure of heavy use. If your PC often spontaneously shuts off while you are playing games and plenty of air is flowing into the freshly cleaned case, your power supply is probably to blame.

Another possibility is that your beefy power supply may be starting to fail (in which case it's time for an upgrade); or perhaps you've recently upgraded your PC with a power-hungry component such as a second graphics card, and your old power supply can't deliver enough juice to keep your system going strong when you start running demanding applications. If that's the case, simply remove the component until you can upgrade your power supply to match your needs.

## Prevent Windows Firewall Nagging

**30 seconds:** Windows 7 users know how needy the operating system's built-in firewall utility can be—and on all new Windows 7 PCs, it's switched on by default. If you get tired of its constant nagging, or if you've accidentally blocked a mission-critical application from accessing the Internet, you can bend the firewall utility to your will by using the little-known Windows Firewall control panel.

To reach it, press the <Windows> key, type Allowed Applications into the search field, and press <Enter>. You should see a window that lists every application on your PC that Windows Firewall knows about. Click the *Change settings* button at the top of the menu, and you can start making adjustments, blocking applications from accessing the Internet or flagging them so that they can access the Web only through specific networks—your home network, a café, your office, or anything else you designate.




**Allowed Apps:** In this window, you can specify apps that you would like Windows Firewall to permit to access the Web at need.

## Clear Out a Gunky PC Case

**2 minutes:** A dirty PC is prone to overheating and dying young, so take the time to clean the dust and debris out of your case every few months to keep your PC in tip-top shape. Simply open your case and use a small brush or handheld vacuum to gently remove all of the loose debris and rid the flat surfaces of as much dust as you can.

When vacuuming inside a system, don't use a high-power vacuum and definitely don't drag the vacuum's hose or nozzle along the surface of your PC's circuit boards. The last thing you want to do is to knock off a surface-mounted capacitor or resistor and suck it up into the vacuum. Use the vacuum sparingly, and focus on gobbling up the largest bits of debris that have settled inside the case and on fans, heat sinks, and the like.

## Rehabilitate a Misbehaving Monitor

**4 minutes:** Monitor problems are incredibly frustrating, but they usually aren't difficult to fix. When your screen starts misbehaving, try the simplest solution first: Disconnect and reconnect your cabling to ensure that all connectors are firmly plugged in. Often that's all it takes.

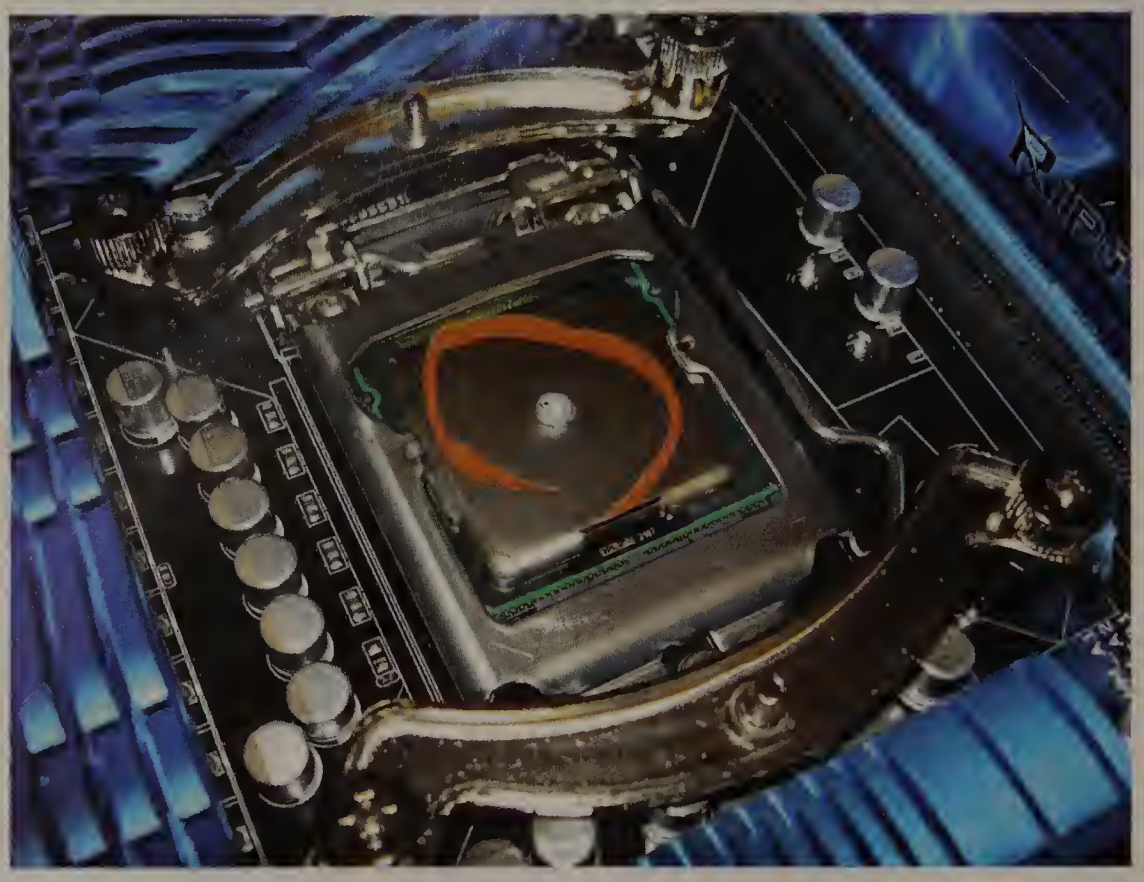
If the problem persists, a cable or one of the ports on either the monitor or the PC may have degraded; try using a spare cable (or borrow one from a friend); if the monitor still balks, see if using an alternate port (most contemporary monitors and PCs have multiple display ports) solves the problem.

If you still have problems with a blank screen, and your system has a discrete graphics card installed, it's time to open up the case. Switch off your PC's power, unplug the power cable, and open up the PC case. Reseat the graphics card, and then check to confirm that it's firmly attached to the PCI port. While you have your computer's case open, make sure that all of the cooling fans inside your case are clean and dust-free, especially the ones attached to the graphics card itself. Graphics cards often exhibit weird graphical glitches and color errors when they overheat or are on the verge of failing.

## Fix a Malfunctioning Keyboard

**1 minute:** If you're banging away on your keyboard and suddenly you notice that nothing is happening on screen, you probably have a busted keyboard. But before you throw it away in disgust and head off to buy a new one, make sure the problem isn't just a port issue: Unplug the keyboard from your PC, plug it into a different USB port, and see if the nonresponsiveness persists.

If your keyboard doesn't connect via USB, it's probably an older PS/2 keyboard, and you may need to download the appropriate driver software in order to tell your PC how to understand it. You can find Microsoft's generic PS/2 multimedia keyboard drivers at go.pcworld.com/ps2driver. »



**Thermal Paste:**

A single drop of thermal paste is all you need to afix a heat sink to a CPU to conduct heat away from the processor effectively.

## Sharply Curtail Long Boot Times

**3 minutes:** Many PCs take much longer to boot into Windows than they should because they waste time loading a bunch of programs that you don't need at startup. You can switch off most such programs, known as startup services, with little risk. By doing so, you'll shave precious seconds off your boot time, and you can always launch the programs manually if you want to use them later.

To shut down unnecessary startup services, press the <Windows> key, type **Run**, and then press <Enter>. In the resulting Run command box, type msc**onfig** to launch the System Configuration utility, and navigate in that utility to the Services tab. There you'll see a list of all of the programs that start up automatically when you boot into Windows. For safety's sake, check the box that says *Hide all Microsoft services* before you make any other changes. Then disable every utility that you don't need to have start up automatically. Turn off Adobe Updater and Steam, for example, and run them manually when you want to use them.

## Use Thermal Paste to Fix a Too-Hot CPU

**4 minutes:** If your PC is overheating and you're comfortable working on its interior, consider replacing the old thermal paste. The thermal interface material (or TIM) used between CPUs (and GPUs) and their heat sinks breaks down over time and becomes less effective at conducting heat away from a PC's components. To replace the thermal paste, carefully remove the heat sink and use isopropyl alcohol (or any other alcohol-based cleaner that won't leave any residue) to clean the old thermal paste from the base of the heat sink and from the surface of the chip it was mounted on. Once the surfaces are clean, apply a few drops of fresh TIM and remount the heat sink. For detailed instructions on how to apply TIM and how to install heat sinks on both AMD and Intel processors, check out our guide to installing a CPU cooler (go.pcworld.com/cpucooler).

## Disable AutoPlay

**30 seconds:** If you're tired of clicking through the annoying AutoPlay pop-up window every time you plug something into your PC, disable it from within a hidden Windows menu. To do this, first plug the offending device—a camera or smartphone, for example—into your PC and allow the device to install any necessary drivers. Close the AutoPlay window when it pops up, safely disconnect the device, and then plug it back in. When the audacious AutoPlay window pops up again, select *View more AutoPlay options in Control Panel*. Choosing that option will cause Windows to take you to Control Panel; scroll down the list of recognized devices there to find the latest device, and change the 'Choose a default' option to *Take no action*. Click *Save*, and AutoPlay should never trouble you about that specific device again. If you want to switch off AutoPlay completely, select *View more AutoPlay options* at the top of the screen and disable the *Use AutoPlay for all media and devices* option.

## Run Old Software in a Time Machine

**30 seconds:** Need to run a program like it's 1999? You can tweak Windows to deceive crotchety applications into thinking that they're running on Windows XP, Windows 2000, or even Windows 95. If you have an outdated program that doesn't play well with Windows 7 or 8, simply right-click it and select *Troubleshoot compatibility* from the menu. Next, choose *Troubleshoot program* and skip through the troubleshooter by clicking *I don't see*

*my problem listed*. On the next screen, you can pick an older version of Windows to emulate while running the application—use the *Start the program* button to test whether your application will run in an older version of Windows. If everything works, make the arrangement permanent by clicking *Yes, save these settings for this program*, and you're ready to rock with classic style.

## Fix Cable Creep

**2 minutes:** Some people tend to the cables and twist ties that trail behind their desks as though these extensions were Zen garden elements, raking, pruning, and manicuring every last one. But cable management need not be such a painstaking task. Follow these three simple steps whenever you connect a new device to your PC, and you'll discover cable bliss.

First, always label each cable. Masking tape and a pen will do the job, or use a label maker. Attach a label at each end, so that the cable is easy to identify both at the device and at the power outlet.

Next, label your chargers and wall-warts. And finally, prevent cable chaos by setting up some simple routing channels. You don't need anything fancy: Running cords through a paper-towel tube will do the trick, keeping your cables neatly organized and out of the way.

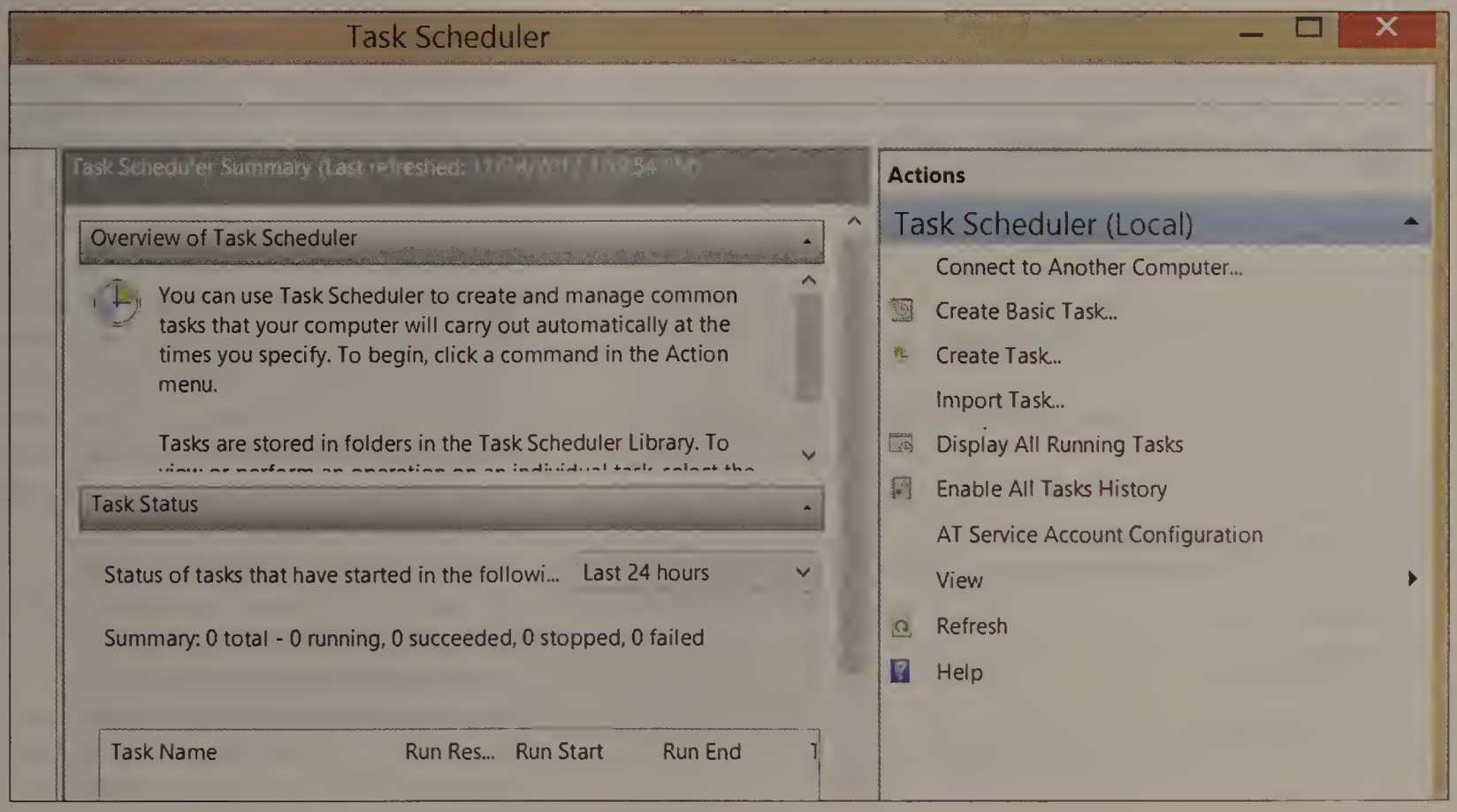
## Automate Critical Maintenance Tasks

**2 minutes:** The best way to stay ahead of common PC problems is to prevent them from happening in the first place, by regularly performing critical maintenance tasks such as defragmenting your hard drive. Conveniently enough, you can arrange for your computer to handle these critical tasks for you, through the handy Windows Task Scheduler utility.

Launch the Task Scheduler by typing Task Scheduler in the Start Menu. Then choose the *Create Basic Task* option to create a simple, timer-based, automatic task. The Task Scheduler wizard will walk you through the process of selecting which application to run and then specifying how often it should occur. Of course, the Task Scheduler can only launch a program; to make the program perform an action automatically—for example, setting up CCleaner to run a complete scan automatically—you'll have to modify the program's command line in Task Scheduler to include specific arguments. If you're using CCleaner, for example, you can modify the command line to read 'ccleaner.exe /AUTO', to make CCleaner launch and automatically run a system scan that conforms to your custom settings. You can usually find a decent list of command-line arguments for a piece of software on its developer's website. »

### Setting Tasks:

Windows' Task Scheduler lets you automate various maintenance tasks, including planning how often to perform the specified operation.



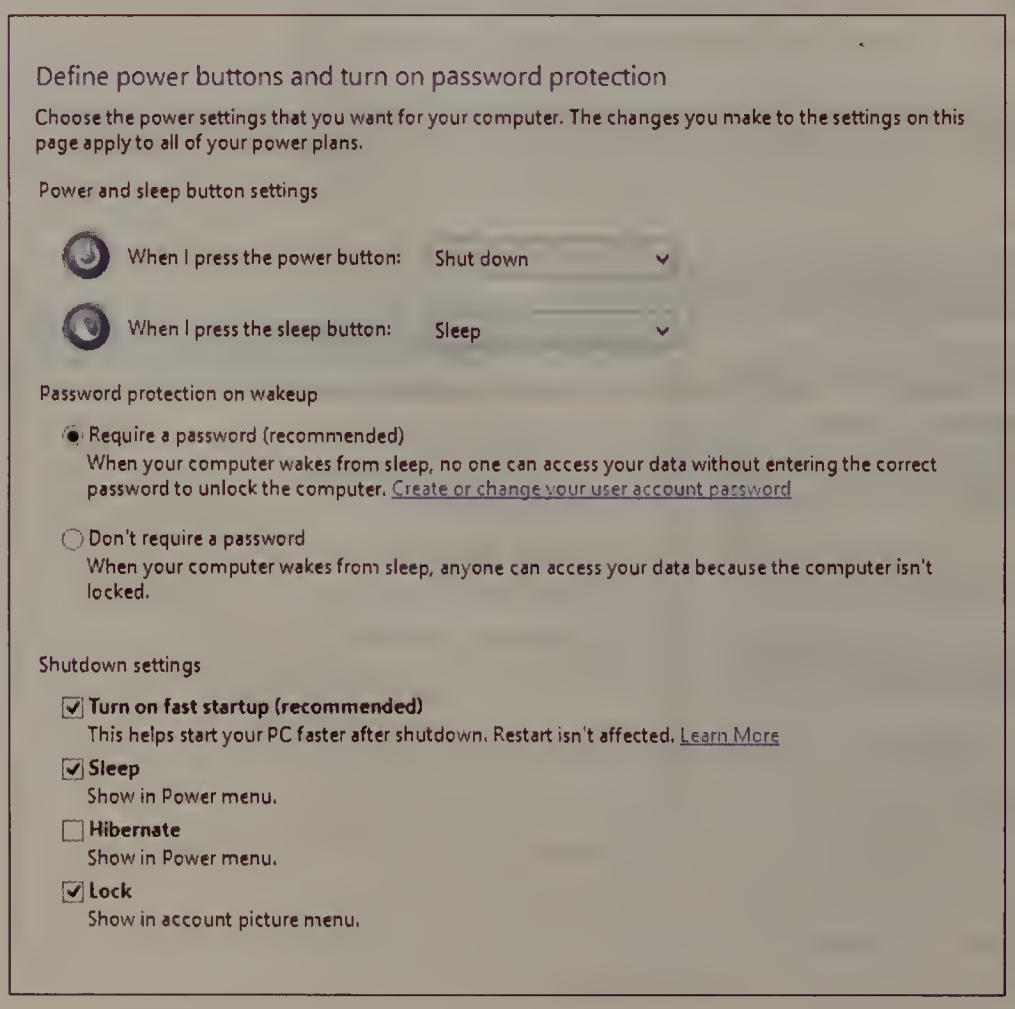
# Windows 8 Tricks

## Heavy Sleeper Mode:

You can restore hibernation mode to your Windows 8 system to reduce the power your PC uses while inactive to a trickle.

### Avoid the Windows 8 Password Screen

**3 minutes:** If you're the only person who ever uses the PC sitting on (or under) your desk, it's silly to waste time punching in your Windows 8 password every time you start a work session. To circumvent that checkpoint, log in to Windows 8 and press the <Windows>-X key combination. Select *Command Prompt (Admin)* from the menu in the screen's lower-left corner, type **control userpasswords2** in the text field, and press <Enter>. In the User Accounts menu that appears, deselect *Users must enter a user name and password to use this computer*. Click *OK*, and give Windows your password—twice—to verify your identity; then reboot your PC, and boom—no more time wasted punching in passwords.




### Bring Back Hibernation Mode

**1 minute:** Putting a PC into hibernation mode reduces its power use to a trickle—even less than it uses in sleep mode (though PCs do take a bit longer to wake out of hibernation than out of regular sleep). Hibernation mode isn't available by default in Windows 8, but you can easily turn the feature on.

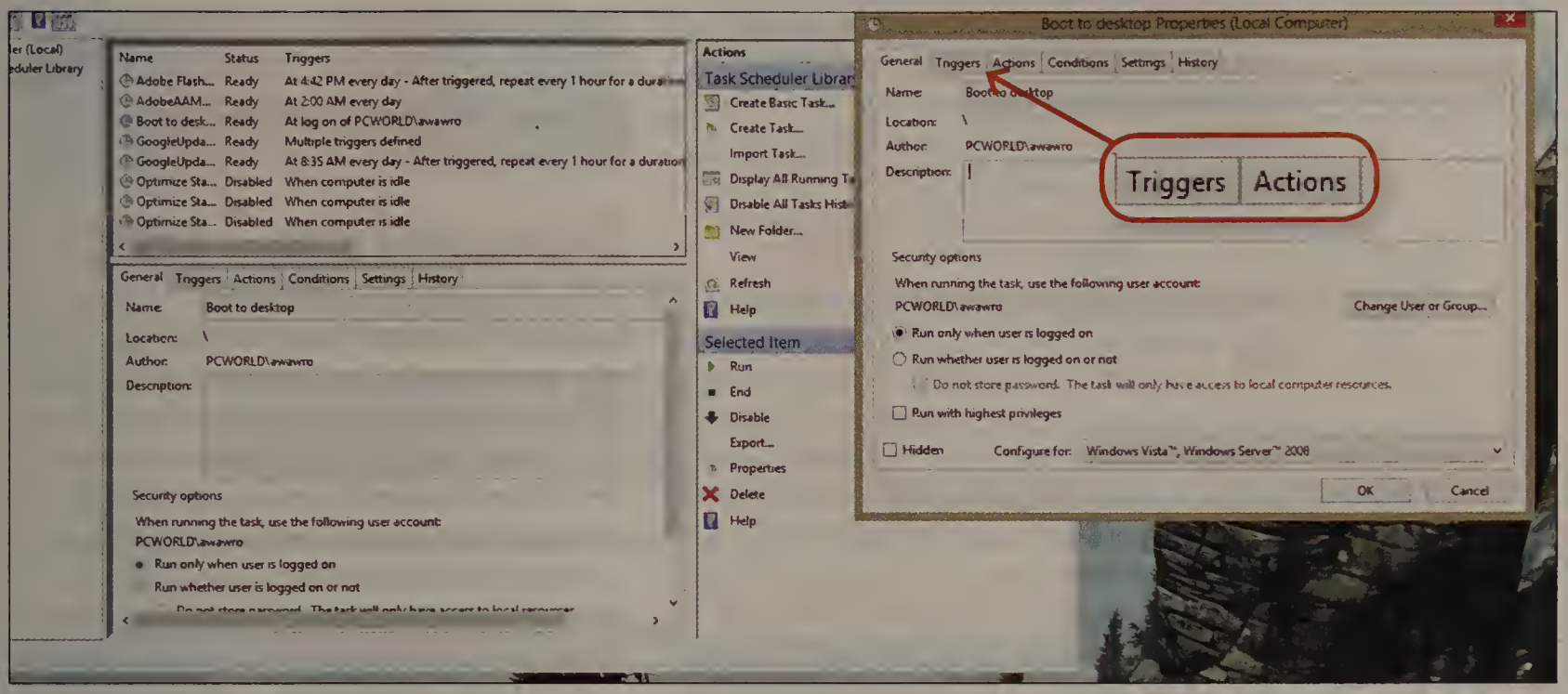
First, access your PC power settings by pressing the <Windows> key and searching for **power**. Then, from the Windows 8 Settings menu, select *Change what the power buttons do*, followed by *Change settings that are currently unavailable*. Scroll down until you reach the 'Shutdown settings' section; there, check the box next to *Hibernate*, and click *Save changes*. At this point you can choose the hibernate option from your Windows 8 Power menu—or you can set your PC to enter hibernation automatically when you close the lid or tap the power button, by changing your PC's 'Power and sleep button settings' options in the System Settings menu.

### Eliminate the Windows 8 Lock Screen

**1 minute:** On a deskbound PC, the Windows 8 lock screen isn't very useful. To get rid of it, press <Windows>-R to open the Run command dialog box, type **gpedit.msc** into the text box, and press <Enter>. Windows 8 will respond by opening the Local Group Policy Editor, where you can switch off the lock screen by using the left navigation menu (*Computer Configuration* ▸ *Administrative Templates* ▸ *Control Panel* ▸ *Personalization*). In the Personalization menu, double-click *Do Not Display the Lock Screen*. Then click the *Enabled* radio button, and end by clicking *OK*.

### Build a Password With Pictures

**3 minutes:** Picture passwords are a hidden gem of Windows 8 security that let you create a unique gesture to unlock your PC. To set up a picture password, launch your Start menu and search for **Picture Password**. Under the Settings category of results, select *Change to create picture password* to launch the Windows picture password wizard. On the resulting page of PC settings, click *Create picture password* and enter your plain-text password to prove your identity. Choose any picture you like to serve as a palette, and use any combination of three taps/clicks, straight drags, and circles to create your new gesture password. Remember the order and




direction of all the gestures you draw on the screen; if you draw a line from left to right in the image, for example, you will have to draw the line from left to right whenever you want to unlock your system.

## Boot Straight to the Desktop

**2 minutes:** You can use Windows 8's Task Scheduler to trick your PC into automatically launching the desktop every time you boot up your PC, enabling you to skip past the much-disliked Windows 8 Start screen. To perform this feat, open the Task Scheduler (*Control Panel* ▸ *System and Security* ▸ *Administrative Tools* ▸ *Schedule Tasks*), and select *Create Task* from the Task Scheduler Library in the left pane. You can name your new task whatever you like, though we recommend something simple like Boot to desktop. Next, open the *Triggers* tab, choose *New*, select the *At log on trigger* from the 'Begin the task' drop-down menu at the top of the New Trigger menu, and click *OK*. Open the *Actions* tab, choose *New*, and type explorer into the Program/script field, to instruct your PC to automatically boot to Windows Explorer—and thus to the Windows desktop—every time you log in to Windows. Adios, Metro!

## Make Your Family PC Child-Safe

**4 minutes:** Limit your child's Web browsing to age-appropriate sites, and block or allow specific sites as needed, with the Windows 8 Family Safety system. You can impose time limits, perhaps locking out the PC during hours when you're at work and not available to supervise. You can also control what games and apps your child can play and buy.

First, set up an account for your child by opening the charm bar (with your mouse or by pressing <Windows>-C) and navigating to *Change PC settings* ▸ *Users* ▸ *Add a user*. If your little user already has a Microsoft account (say, for Xbox Live), you can enter that account. Or sign your scion up for a new account. If the PC you're setting up is the only one your child will be using, you can sign in without a Microsoft account and then tap *Local account*. Check the box marked *Is this a child's account?* and click *Finish*. Now you can use Windows 8 to set limits on your child's allotted computer time, accessible apps, and many other security options. **Bonus:** Once you've completed this setup, you'll be able to keep tabs on your child's activities from this PC or from your own.

## Add a Shutdown Button to Windows 8

**1 minute:** The default Windows 8 shutdown process forces PC users to scramble for power option menus or try to drag in charm bars. Don't do it. Instead, set up your own custom shutdown button in about a minute with this simple fix.

Log in to Windows 8, right-click any empty spot on your desktop, and then select *New* ▸ *Shortcut*. Type **shutdown /s /t 0** exactly as shown here (that last character is a zero) into the Location field, and press *Next*. Name the shortcut **Shut down** (or whatever you like to call your off switch), and click the *Finish* button. The shortcut will pop up on your desktop with a default icon, which you should swap out for a big red power button by right-clicking the newly »

**Skip the Start Screen:**

Use the Triggers and Actions tabs in this window to make your Windows 8 system boot automatically to the desktop.

created shortcut and selecting *Properties*. Next, open the *Shortcut* tab, click the *Change Icon* button, and select the image you prefer from the list. Be careful though: Clicking the power button will immediately shut down your PC, without any follow-up 'Are you sure you want to shut down?' prompt.

### Stop Metro Apps From Autolaunching

**2 minutes:** Windows 8 offers a slew of slick, preinstalled utility apps (including Windows 8 Music, Windows 8 Photos, and Windows 8 Reader). But these apps are inferior to free desktop counterparts such as Adobe Reader and VLC Media Player. You might even prefer using the default Windows Preview utility to view photos quickly on your desktop, instead of loading a separate Windows 8 app.

To reassign the default programs your PC uses to open common file types, right-click in the lower-left corner of your desktop to open Control Panel and then navigate to *Programs* ▸ *Default Programs* ▸ *Set your default programs*. Or search for Default programs in the Start screen. The Set Default Programs menu shows a list of all of your installed desktop programs, and you can scroll down and assign your favorites to function as the default program when you open specific file types—setting Windows Preview to open image files automatically, for example, or using Windows Media Player to open video files instead of the Windows 8 Video app.

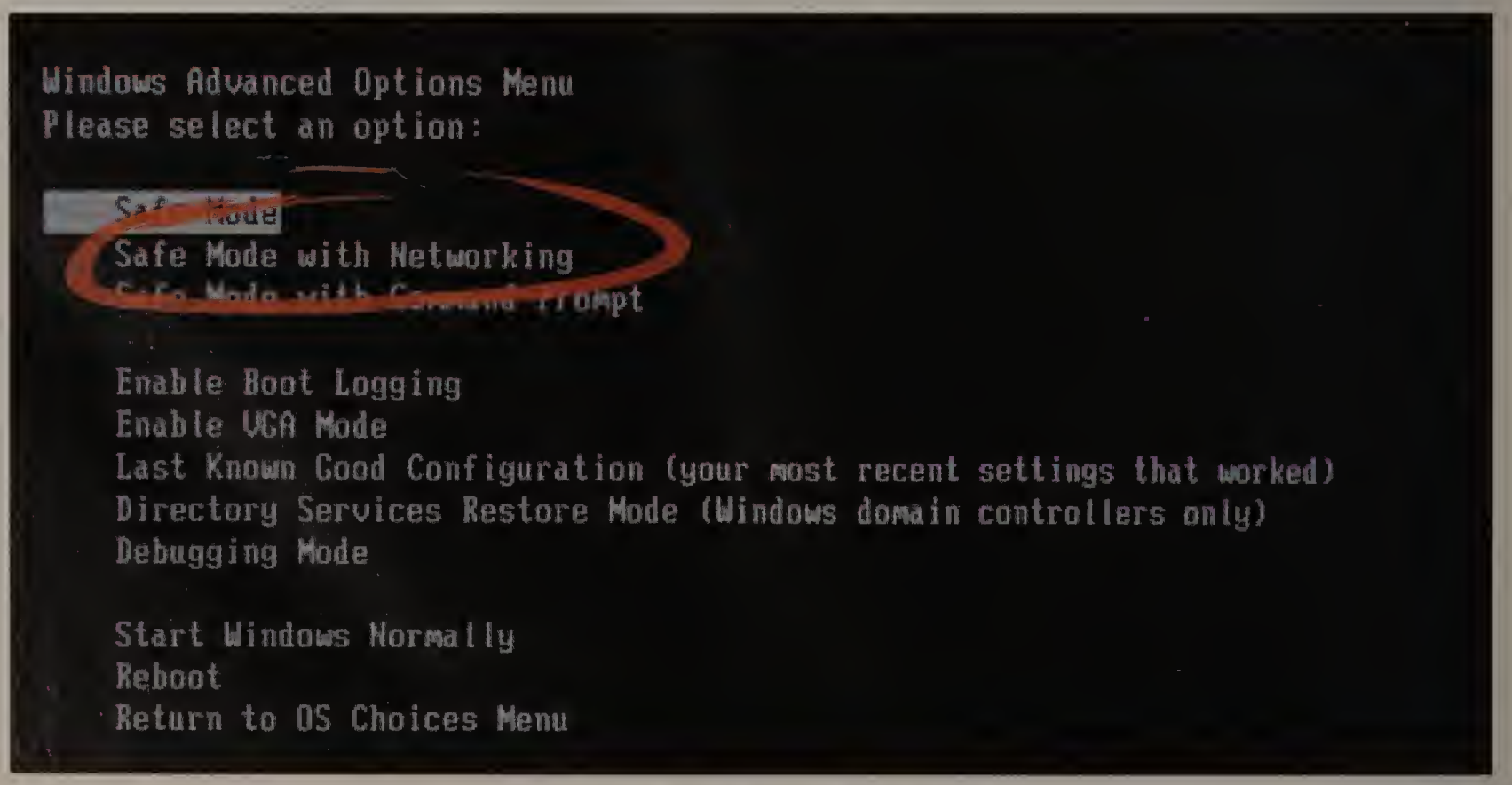
**Safe Mode:**
You'll have to boot into 'Safe Mode with Networking' to run Internet-connected antivirus software on a system compromised by malware.

# Security Tips

### Remove Malware From a Windows PC

**5 minutes:** If you suspect that your PC has a malware infection, boot into Windows' Safe Mode by restarting your PC and pressing <F8> to jump to the Windows Advanced Options menu (if this doesn't work, consult your motherboard's documentation for instructions on booting into Safe Mode). From the Windows Advanced Options menu, select *Safe Mode with Networking* and press <Enter>.

In Safe Mode, run the Windows Disk Cleanup utility. (It's in the *Accessories* ▸ *System Tools* section of the Start menu.) Next, start your antivirus utility or malware scanner. If you don't have one installed, download either Microsoft's Malicious Software Removal Tool (go.pcworld.com/msrt) or Malwarebytes' Anti-Malware (go.pcworld.com/mwbytes)—both are free—and run a thorough scan to find and eliminate malware. Then install a better antivirus program. AVG Internet Security (go.pcworld.com/avgis2013) and Microsoft Security Essentials (go.pcworld.com/mse) are good free antivirus utilities.



## Lock Down Your Facebook Account

**3 minutes:** Enabling two-factor authentication for your Facebook account is a snap. Log in to Facebook, click the blue gear icon in the top-right corner, and click *Account Settings*. Select the *Security* option in the navigation bar on the left side of the screen, click *Login Approvals* under Security Settings, and check the box next to *Require a security code to access my account from unknown browsers*. Facebook will guide you the rest of the way, explaining how to receive a unique alphanumeric code to enter when you want to access your account.

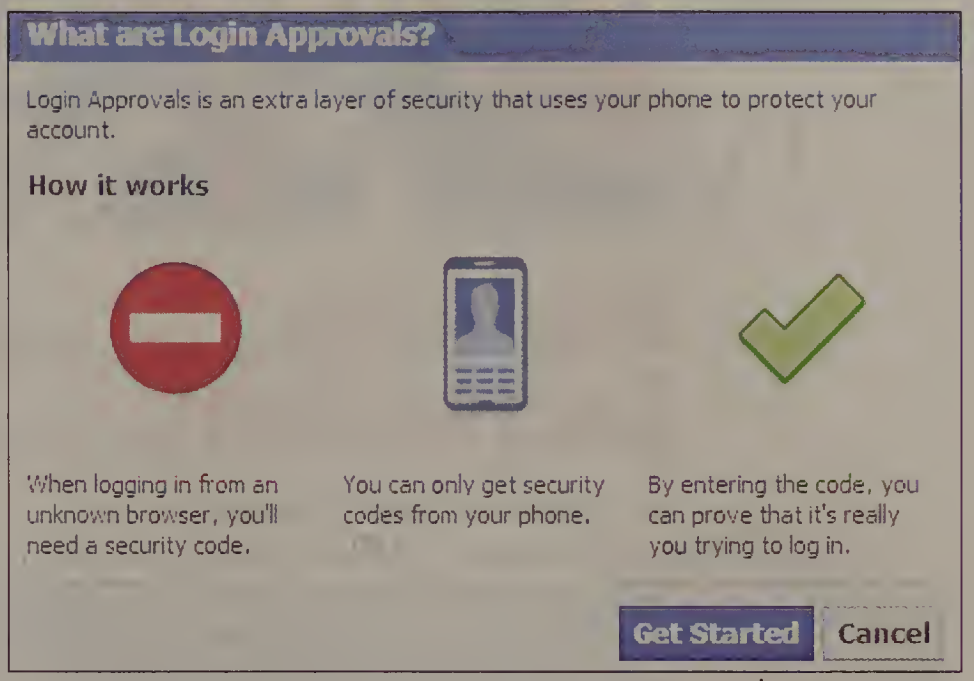
To get that code, you must download a mobile authenticator app (which generates codes every time you log in) or give Facebook your cellphone number so it can send you authentication codes via SMS. We prefer the authenticator app: It's simple to use, and you don't have to wait for Facebook's servers to text you your code. You can also add a cellphone number as a backup if the app fails to work.

In its mobile app, Facebook includes a neat Code Generator feature that generates time-based one-time password (TOTP) codes for your account, but you can use any TOTP authenticator app if you're willing to subvert Facebook's setup process. If you use Google's mobile authenticator app to manage two-factor authentication across multiple services, for example, you can set it up to provide authenticator codes for your Facebook account, too.

To start the Code Generator setup process, click *Set up Code Generator* under Login Approvals in your Facebook security settings. When the time comes to open the Facebook mobile app, click the *Having trouble?* link. Facebook will ask you to click a big blue Get Key button and enter the provided 16-character key into your Facebook mobile app—but you can enter that character key into almost any authenticator app (including Google's), and it will still work.

## Fix a Broken Password

**2 minutes:** Upgrading a bad password is easy. The trick is to use a passphrase—multiple words strung together—rather than a single word, so hackers can't easily crack your password using a dictionary attack. Use at least eight characters in the passphrase, and avoid obvious subjects like proper names, birthdays, and hometown teams. Mix things up with numbers, upper- and lowercase letters, and even a symbol or two. Pick a phrase that will be easy to remember, and be as creative as you like.




## Repair a Corrupt Windows 7 Installation

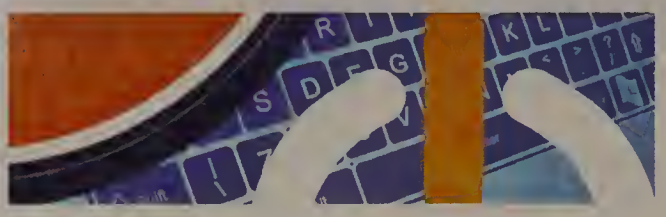
**5 minutes:** If your PC runs Windows 7, you can install a clean copy of Windows 7 without wiping your PC and reinstalling Windows. The first step is to back up all of your critical files to an external storage device (remember to run them through a virus scanner program before you reintroduce them to your freshly cleaned PC). Next, get your hands on a Windows 7 CD that matches the version of Win 7 your PC is running; if you've lost your Windows CD, consult our guide to reinstalling Windows 7 without the disc, at go.pcworld.com/nodisc.

Start the repair process by popping your Windows 7 installation disc into your CD drive and running the Setup utility—if the disc doesn't launch Setup automatically. Click the *Install Now* button, choose whether to download the latest Windows updates—if your PC has a working Internet connection, you probably should download these—and then approve the Windows license agreement. When asked to choose either an Upgrade installation or a Custom installation, choose *Upgrade*; this option will yield a fresh installation of the Windows operating system without wiping your settings and personal files.

The utility will run a quick compatibility check to confirm that your PC plays well with Windows 7; then you'll click the *Next* button to start the repair process. This part of the process isn't so fast: It usually takes between 15 minutes and an hour, depending on how much of your data the utiilty needs to carry over to the fresh copy of Windows 7. Once the installation is complete, you'll just need to answer a few quick setup questions, and then you should be good to go with a clean copy of Windows 7. »

### Block Access:

'Login Approvals' is Facebook's name for two-factor authentication—a straightforward but powerful way to shield access to your account.



# Business Corrections

## Fix a Malfunctioning Network

**5 minutes:** If your network adapter is external, unplug it and then plug it back in. USB Wi-Fi sticks can be finicky. Next, restart your router: Unplug it, wait 30 seconds, and then plug it back in. You may want to reboot your system while you wait.

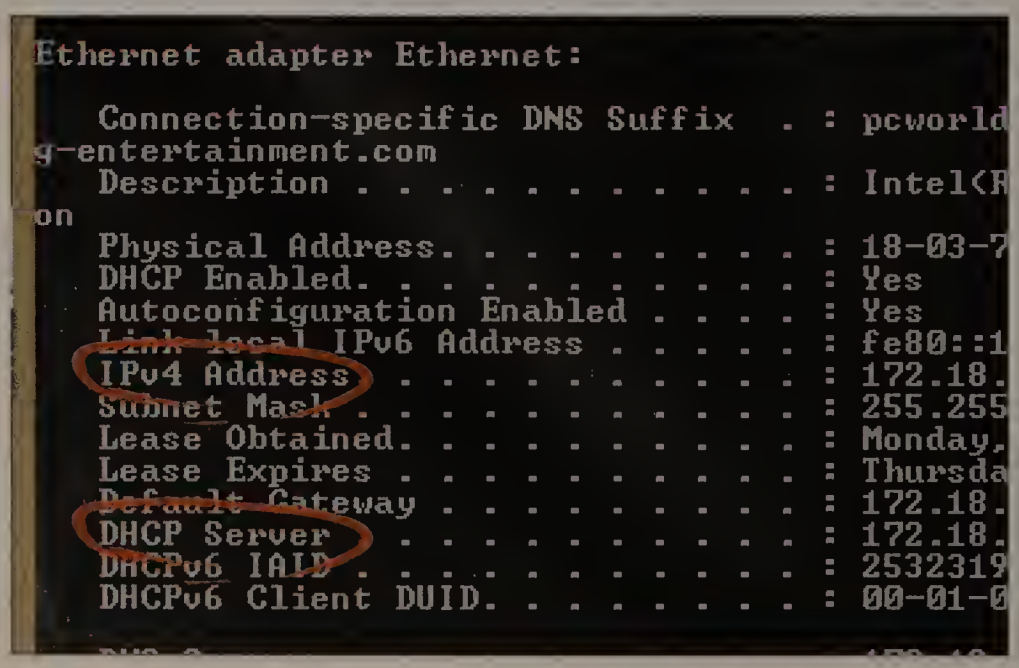
This therapy will heal most network ailments. If it doesn't work, try to access the Internet from other PCs on the network. If they can't reach it either, your service provider may be to blame. Try rebooting the cable or DSL modem connected to your router, using the "unplug it" method described above. Check your machine's IP address to see if the router is properly configured: Press the <Windows> key and type CMD in the search box to launch the command prompt; then type ipconfig /all. To find the proper adapter, scroll down the list and look for the 'IPv4 Address' item. On most home and small-office networks, the first three numbers (separated by periods) of the IP address should match the first three listed for 'DHCP Server'. If not, you might need to reconfigure or reset your router, which may have suffered a glitch.

If you use a software firewall, the program might be interfering with network access. Try turning it off via the Windows Firewall menu in Control Panel.

Finally, if you're on a wireless network, try plugging in an ethernet cable and connecting your PC directly to the router. If this works, the problem likely is your wireless adapter. Update your wireless adapter driver by downloading it from your PC manufacturer.

### Check IP Config

In the command prompt, make sure that both the 'IPv4 Address' line and the 'DHCP Server' line show the same IP address.




## Tidy a Cluttered Outlook Address Book

**1 minute:** Outlook's new People module lets you pull information about contacts from all over the Web, including Facebook and LinkedIn, but using this data often leads to multiple contact entries for a single person, commonly with different details in each place. To eliminate redundant clutter, you can link multiple entries to a single contact.

Click the contact you're interested in, and view the person's information by choosing *Home* ▸ *People*. On the right of the screen, click *Link Contacts*. A dialog box with a contact entry or entries for that person will open. In the Search People box, type some identifying information for that person, and Outlook will return other contact entries that may be a match for that person. Click any of the entries that are for the same person, to link the details.

## Make Office Stop Autocorrecting You

**1 minute:** No one likes having a PC overrule their style decisions. If you don't want three periods (...) to become an ellipsis, or three hyphens (---) to turn into a page-wide horizontal line—or if you dislike any other default automatic "correction" that Office performs—here's how to put a stop to it.

Type the word or character sequence you want to change—and stop typing immediately once the AutoCorrection occurs. A small icon with a lightning bolt will appear on the screen, next to the correction. Click the box and select the menu's second option (*Stop Automatically Correcting [whatever it just autocorrected]*). For example, if you had just typed a > symbol, the option will read 'Stop Automatically Creating Bulleted Lists'. Select this menu item to terminate the autocorrection behavior permanently.

For more-detailed AutoCorrect settings, or to remove specific words from Office's list of automatic typo fixes, click the *Office* button and go to *Word Options* ▸ *Proofing* ▸ *AutoCorrect Options*. Look under the 'AutoFormat As You Type' tab for additional settings. ●

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# America's Fastest Wireless Networks

We ran more than **18,000 tests** in **20 cities** to identify the nation's wireless-network winners and losers.»

BY MARK SULLIVAN AND LEAH YAMSHON

**ENHANCED EDITION**

**VIDEO BONUS**

Get a closer look at our testing in Boston.

PHOTOGRAPHS BY ROBERT CARDIN

# How We Tested the Nation's Networks

**OUR APPROACH TO testing wireless service is to replicate how people use such service in the real world, and to measure how well it truly works. We do the testing ourselves, instead of crowdsourcing the data. We take care to measure the services under similar and repeatable conditions: We use the same devices, so that the comparisons we make really say something about the relative value of each service.**

**We chose our 20 test cities for their varying population densities, physical topography, and cellular environments. In each city we tested at ten locations, five indoors (often in a Starbucks or a similar place) and five outdoors. We selected the locations based on a grid covering the center of the city; we did not test in suburban or rural areas.**

**We used an automated tool developed by OpenSignal (opensignal.com) that sends files to and from Internet servers. The servers are located in the same region as each testing city, so as to minimize variance. We tested each location until we had eight valid tests for each metric—download speed, upload speed, and latency—for each service. We tested on weekdays, between 8 a.m. and 6 p.m.**

**For 3G, we used the Apple iPhone 4S. For 4G/LTE, we used the Samsung Galaxy Note II. If at a given location we could not receive 4G/LTE service after several attempts, we did not use a fallback 3G-service speed or enter a score of zero when tabulating the carrier's average speeds. Instead, we recorded the failure in a separate "Reliability" average score.**

**To measure network latency, we pinged google.com servers three times for each service at each testing location.**

**Because signal quality depends on variables such as network load, distance from the cell tower, weather, and time of day, we can't predict performance in a specific area based on our results. But the results do illustrate the relative performance of wireless service in a given city on a given day.**

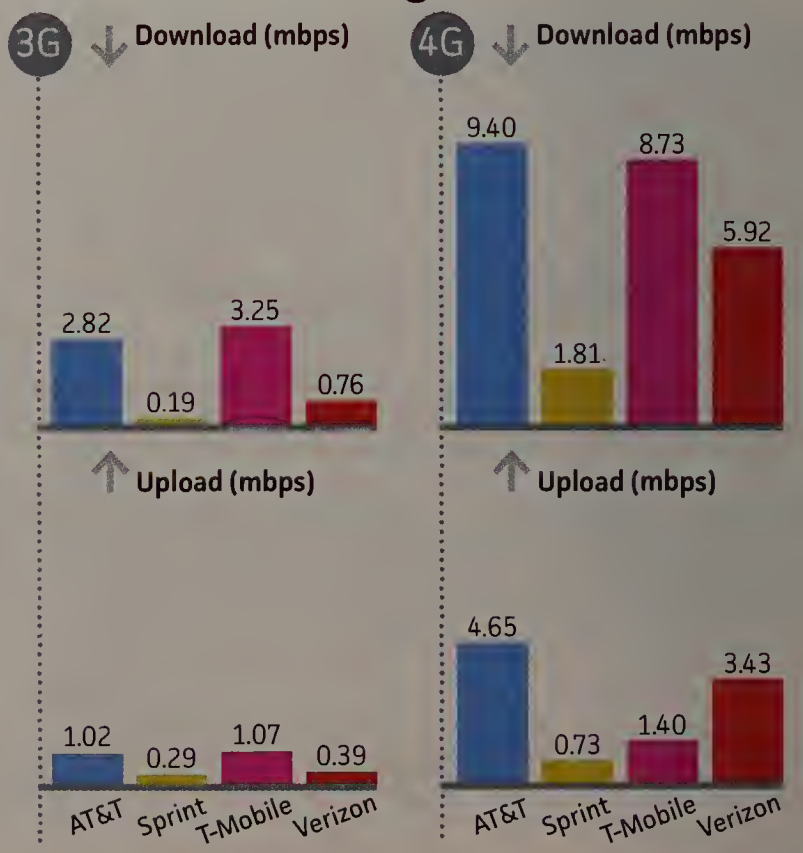
OUR INTERNET EXPERIENCE has become irreversibly mobile, and the stakes couldn't be higher. It's not unusual for a family to pay $2000 a year in wireless-service bills alone. For anyone living in the United States, in fact, the cost of moving 1MB of data over a cellular network is among the highest in the developed world.

The speed at which smartphones and tablets connect to the Internet couldn't be more important. That's why *PCWorld* (now with our sister site TechHive.com) regularly conducts the nation's largest independent-media study of real-world wireless network performance. Focusing on the four major U.S. wireless networks, we seek to arm you with the information that you need to judge the carriers' marketing claims about their networks, weigh the relative value of each carrier's offerings, and ultimately make a more informed decision when you're buying a device and signing up for service.

This year's study, our fifth, is our largest to date. In partnership with testing firm OpenSignal, we visited 20 medium-size and large U.S. cities in April and May to measure the speeds of the 3G and 4G wireless data services of AT&T, Sprint, T-Mobile, and Verizon. Our mission was to capture a real-life snapshot of the performance of each company's service.

## Performance Results By City

### Ann Arbor, Michigan

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## Overall Winners and Losers

| 3G Winner | 3G Loser | 4G Winner | 4G Loser |
|---|---|---|---|
| **T-Mobile** | **Sprint** | **AT&T** | **Sprint** |
| **T-Mobile HSPA 14.4 service was almost 4G-fast in Chicago, as well as in all of our eastern U.S. testing cities.** | **Sprint's nationwide 3G and 4G network upgrade has not moved the dial on 3G speeds since last year.** | **AT&T's LTE service is not nearly as widespread as Verizon's. But where it is available, it's fast and getting faster.** | **Although Sprint's LTE service has spread rapidly to 88 markets, it may be too weak for some bandwidth-intensive tasks.** |

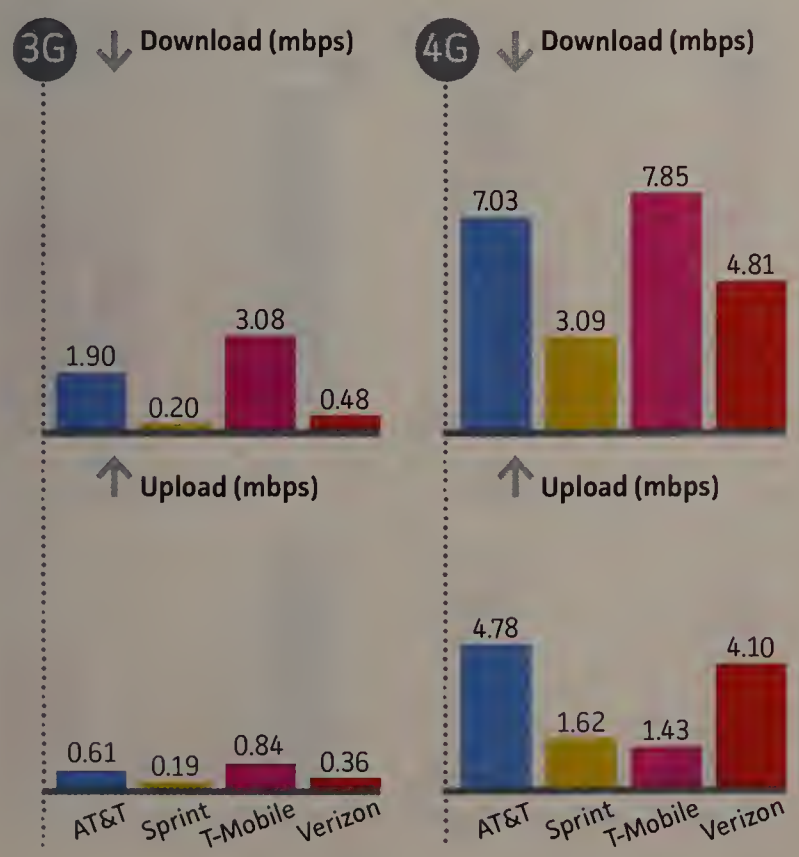
NOTE: The winners and losers are the carriers with the fastest and slowest download speeds, on average, in tests we conducted at 200 testing locations in 20 cities.

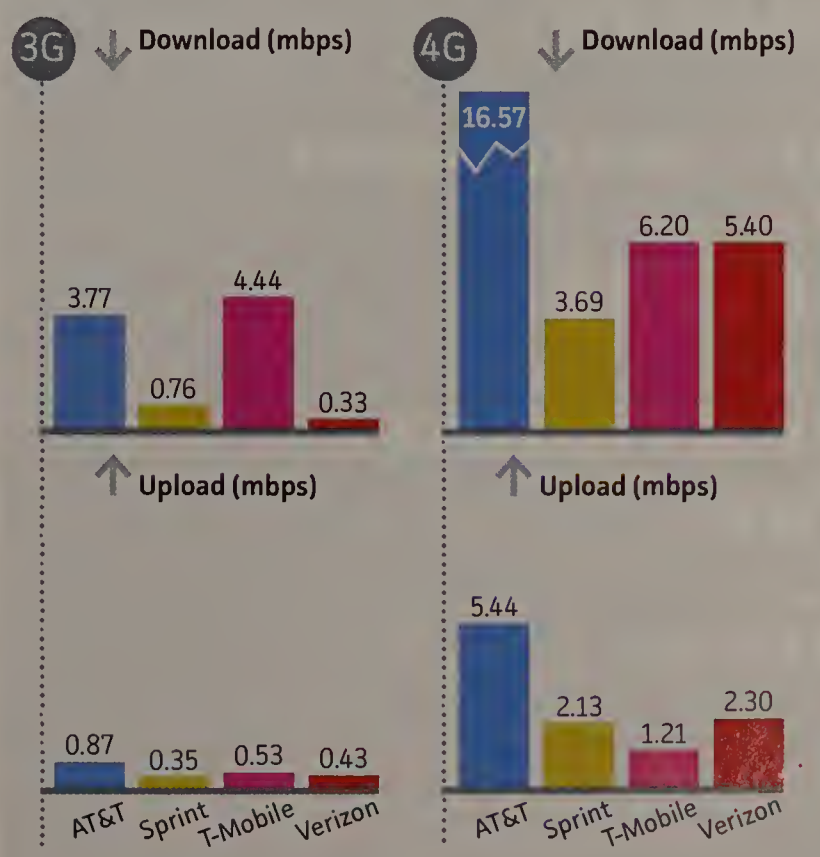
We can't present our findings, however, without first discussing wireless-infrastructure changes in the United States. Currently the carriers are continuing their transition from the older 3G technology to the newer and much faster 4G/LTE. The U.S. market's two big dogs, AT&T and Verizon, are well into the process of building their LTE networks and moving customers over to them. Meanwhile, the two small dogs, Sprint and T-Mobile, are just now getting their LTE game on.

Verizon has brought its LTE service within reach of 287 million people, and AT&T has made LTE available to 200 million people, according to the companies. Meanwhile, Sprint has announced coverage in a good number of cities—88—but our tests show that its LTE network performance is relatively weak so far. As for T-Mobile, although the carrier has formally announced only seven LTE cities as of this writing, we were able to connect to its network and perform tests in several more.

The "LTE gap" was one of the reasons why Sprint and T-Mobile lost a lot of subscribers to AT&T and Verizon in 2012. During the year, the two big dogs poached nearly half of their new postpaid subscribers from the two small ones. At present, AT&T and Verizon together serve more than two-thirds of wireless subscribers in the United States. (Verizon has a slight lead in overall share.) Sprint holds 17 percent, and T-Mobile owns 13 percent.

As Sprint and T-Mobile grow their LTE networks, some industry analysts say, subscriber defections may slow down dramatically for both carriers in 2013. T-Mobile reported subscriber losses of about 200,000 in the first quarter of this year, versus »

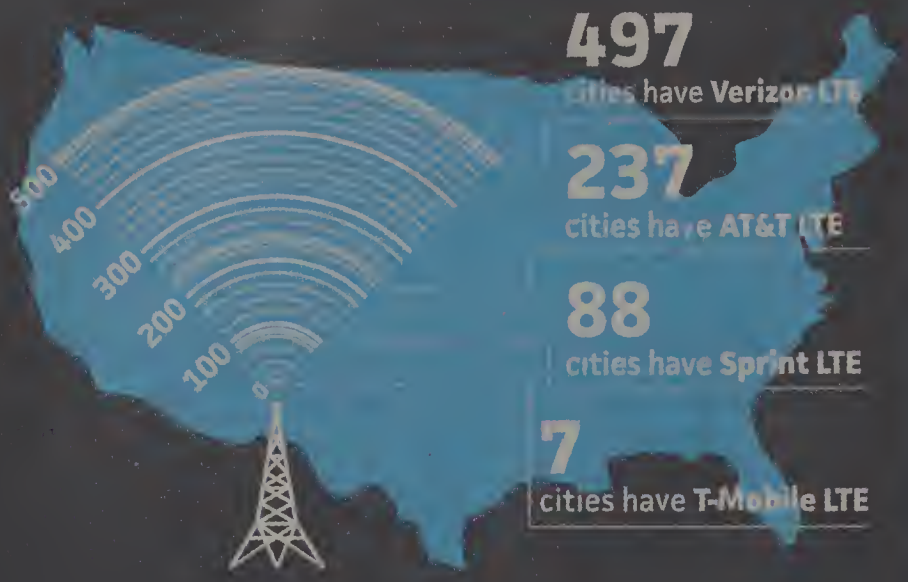


# LTE By the Numbers

The next generation of wireless technology is quickly replacing the 3G service we're used to. Here's what you need to know.

## Who's selling it?




## Who has the devices?

**AT&T**

24 smartphones

6 tablets

**Verizon**

20 smartphones

6 tablets

**Sprint**

15 smartphones

3 tablets

**T-Mobile**

6 smartphones

0 tablets

SOURCES: IDC, Netbiscuits, and the wireless carriers. CHART NOTE: City totals include only those cities announced by the carriers as of 5/6/13.

more than 500,000 in the last quarter of 2012. Many of Sprint's subscriber losses have resulted from the shutdown of its Nextel network and the ensuing defection of Nextel customers to other carriers. That shutdown will soon be completed, and Sprint's subscriber losses may slow way down as a result, too.

### 3G Still Matters

As much as we hear about LTE service these days, however, the fact is that three-quarters of U.S. wireless subscribers still use good old 3G service. For AT&T and T-Mobile customers, that entails HSPA service (although the companies call it "4G"), while Sprint and Verizon users are relegated to CDMA service.

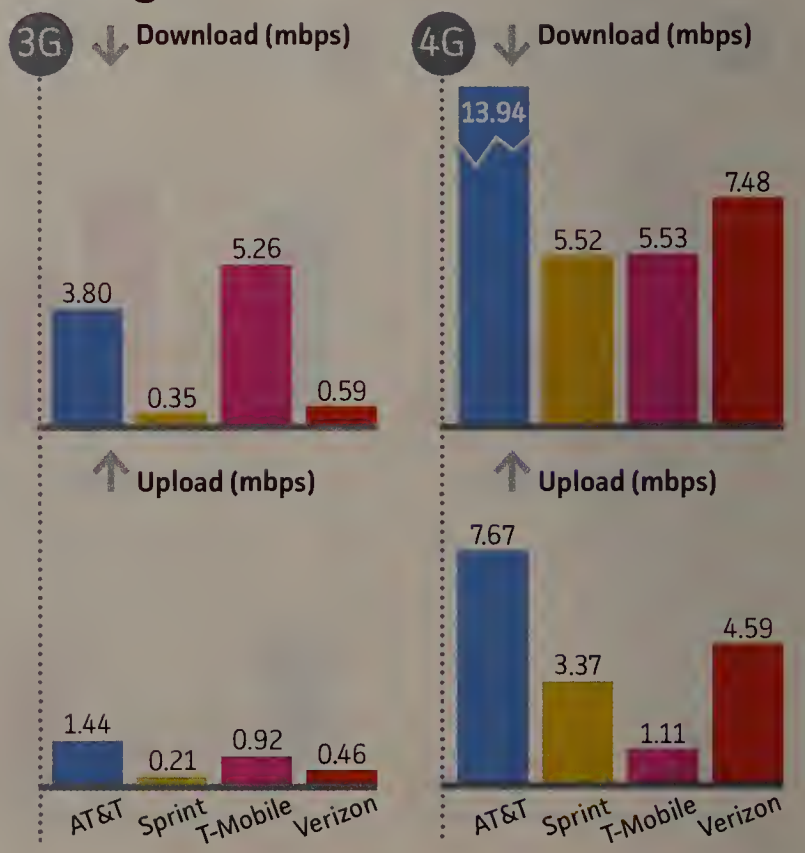
All four carriers have faced a significant challenge in funding the build-out of their LTE networks while reserving enough to pay for the upkeep of their 3G networks. This maintenance is important for connecting 3G smartphone users to the Web, of course, but it's also critical because all of the carriers still run their voice services over their 3G networks. The migration of voice services to the LTE networks is still years away.

On top of that, when your cool new LTE phone loses touch with your LTE network, the phone's radio immediately connects to the carrier's 3G network for your data service. And since 3G is slower, that downshift needs to be smooth—the switch shouldn't yank you down to a speed so slow that you can't continue what you're doing. If such a jolt were to happen while

INFOGRAPHIC: FLYING CHILI

## Performance Results By City

### Chicago

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## Average Wireless Speeds Coast to Coast

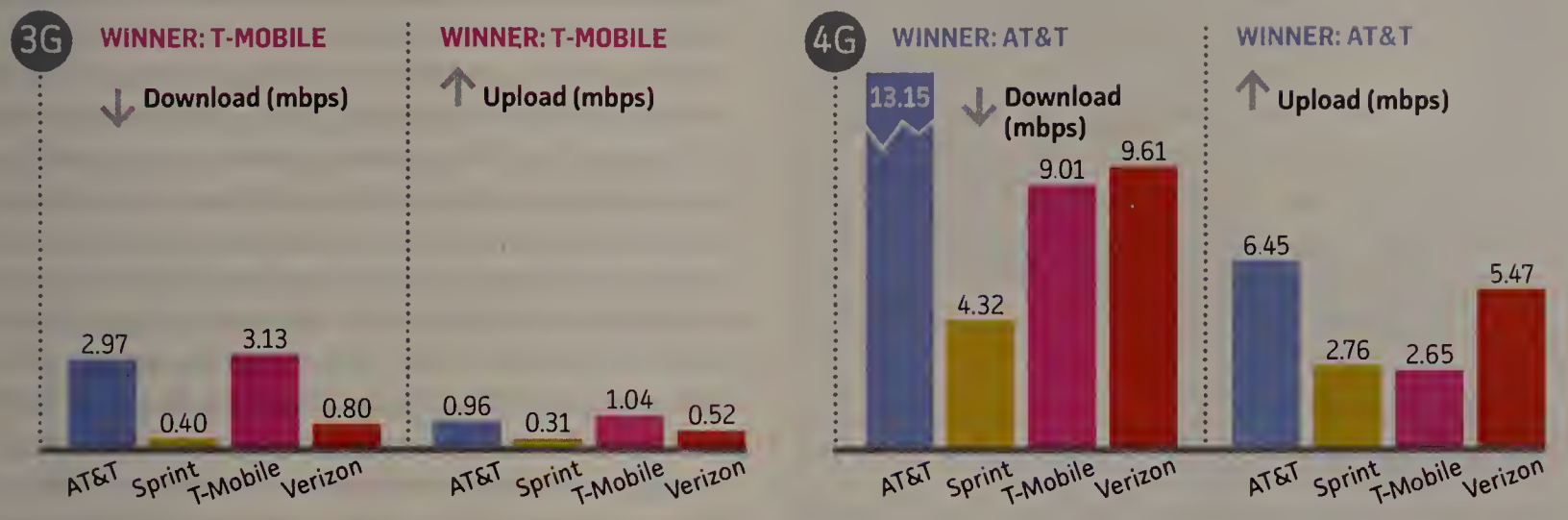



CHART NOTES: Listed 3G and 4G download and upload speeds are the averages of carrier-service speed scores measured at ten locations in each of 20 testing cities. Speeds are expressed in megabits per second (1 megabit = 1000 kilobits). We used a Samsung Galaxy Note II to test 4G service and an iPhone 4S to test 3G service.

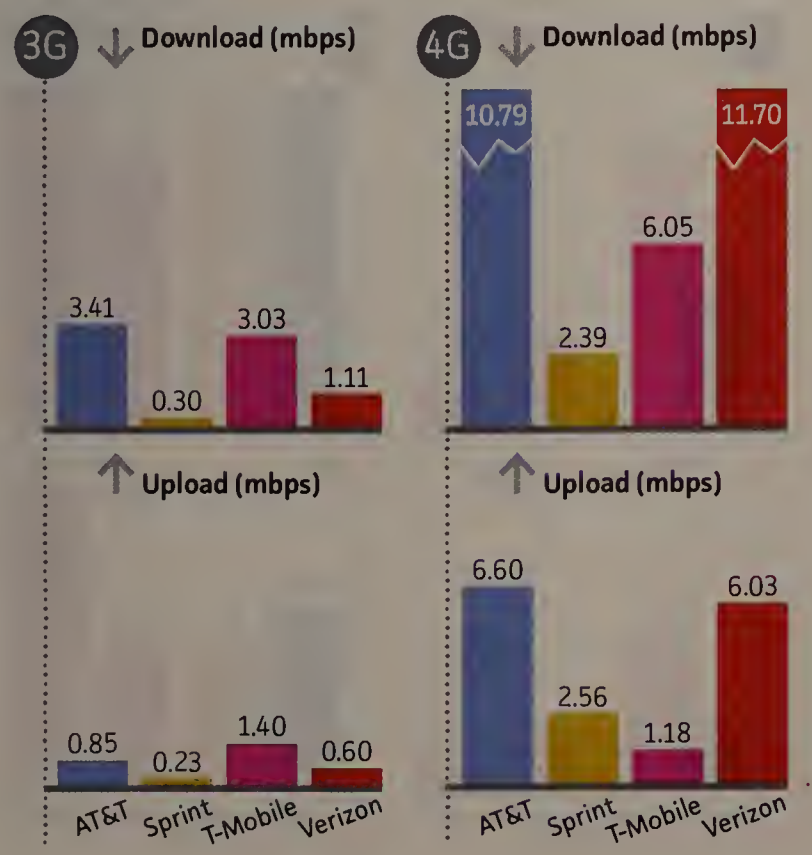
OpenSignal

you're watching streaming video, the movie might stutter, playing in fits and starts. It might even stop working altogether.

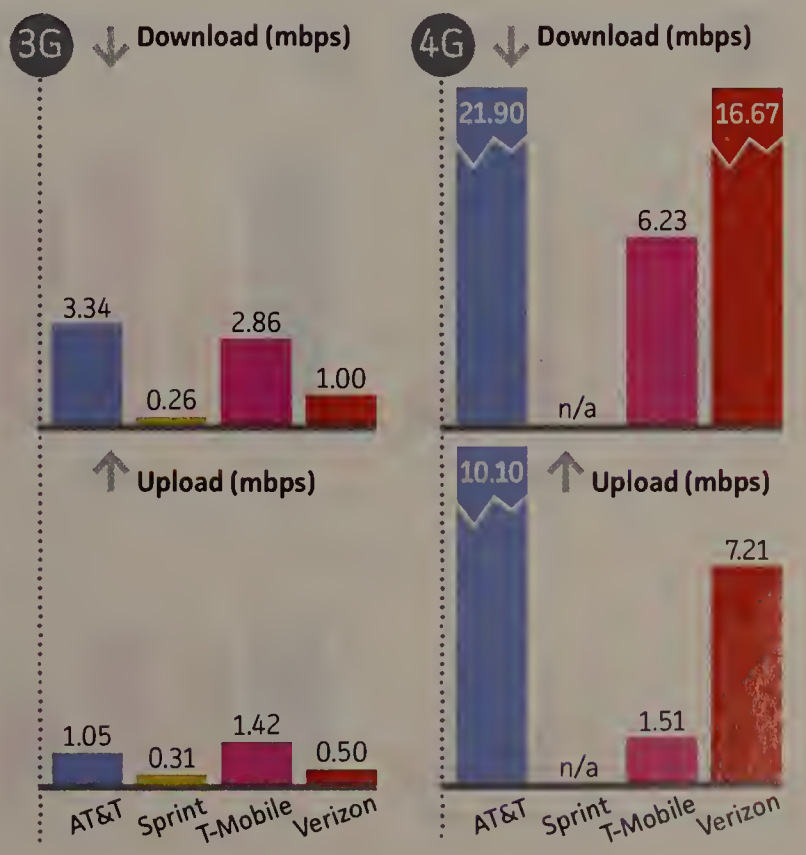
That's why a comparison of both 3G and 4G speeds is important. The fastest LTE speeds can be easily forgotten if your backup 3G service slows your device's throughput to a trickle.

For now, 3G still matters. A lot. "Despite all of the hype around 4G, the performance of 3G networks remains an important consideration; with most service providers still expanding the coverage and capacity of their 4G LTE networks, 3G is often the dominant technology used by most customers today," says Dan Hays, U.S. wireless advisory leader at PwC. "The continued advances in 3G speeds demonstrate that service providers »

### Dallas




### Denver



are not standing still there, either; they continue to invest in maintaining and even advancing performance, as 3G networks will continue to be used for many years to come."

Of course, for consumers, new technologies and coverage announcements mean little compared with the day-to-day availability and performance of the networks as they exist. What counts is how quickly and easily phone and tablet users today can reach the Web and get the information they want. Here are our results from this year's wireless network tests, with the carriers discussed in the order of their overall ranking.

# AT&T

## LTE Leads the Field Again, and 3G Speeds Up

About 30 percent of AT&T's smartphone customers have an LTE device, the carrier says. AT&T tells LTE users to expect speeds of 5 to 12 megabits per second for downloads and 2 to 5 mbps for uploads, but in our tests it delivered a bit more, pushing the high end of the download range and exceeding the upload range.

For the second year in a row, AT&T's 4G LTE service proved to be the fastest in our tests, with average download speeds of 13.15 mbps and average uploads of 6.45 mbps. We saw average download speeds above 15 mbps in Boston, Denver, Las Vegas, San Diego, San Jose, and Seattle. The average in Denver and San Jose surpassed 21 mbps, marking the only 20-plus-mbps showings of any service in our study. AT&T LTE had average download speeds of greater than 10 mbps in 16 of the 20 cities we tested.

AT&T's average upload speed for LTE dipped below 5 mbps in only four cities: Ann Arbor, Atlanta, Los Angeles, and New York. AT&T's fastest city for uploads was Denver, with an impressive average speed of just above 10 mbps. At that rate, you could upload a 7.5MB video in merely 11 seconds.

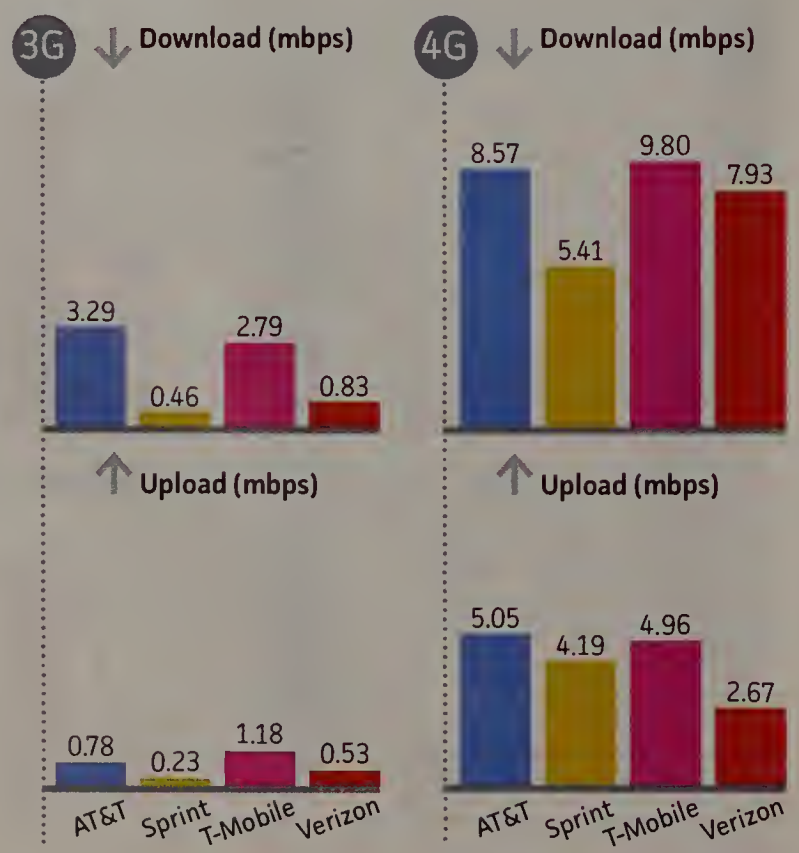
"We believe this study validates the good experience we're working hard to provide our customers, combining the nation's fastest 4G LTE and the nation's largest 4G network," said AT&T VP of network technologies Kris Rinne in a statement. "We're proud every time an independent source points this out."

AT&T's 4G LTE, however, isn't nearly as widespread as its 3G HSPA+ service (which the company markets as 4G service). Fortunately, AT&T appears to be stepping on the gas pedal when it comes to HSPA+ network performance improvement. Although AT&T doesn't say exactly how much money it has dropped into its HSPA+ networks over the past year, its speed scores in our study suggest that the investment has been sufficient to meet subscribers' quickly growing demand for data service.

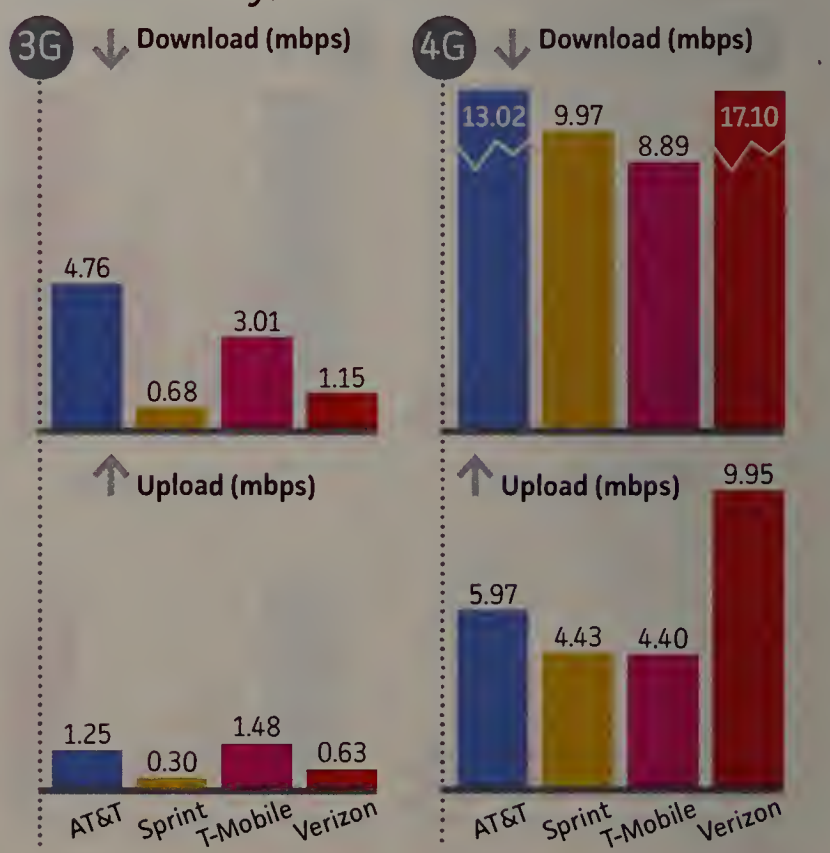
AT&T's 3G service clocked a 20-city average download speed of almost 3 mbps. For upload speeds, it averaged just short of 1 mbps. Download speeds were reasonably consistent across most of our testing cities. The service posted its lowest speeds

## Performance Results By City

### Houston




### Kansas City, Missouri



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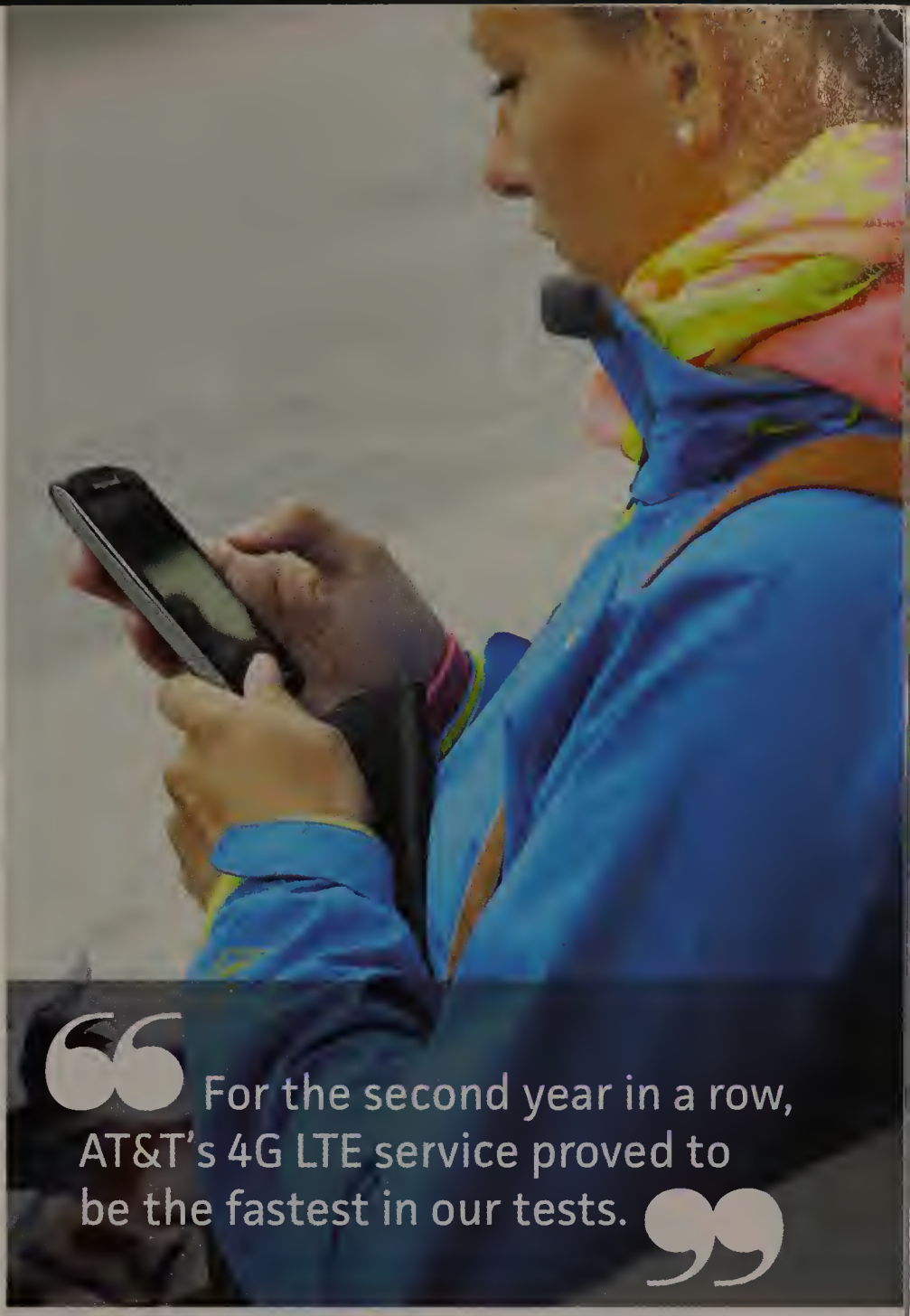
in Philadelphia (0.87 mbps), and its highest in San Diego (5.04 mbps). Putting those numbers in real-world terms, in Philly it might take 80 seconds to download a 4.5MB MP3 file on AT&T's 3G network, while in San Diego it might take only 13 seconds (assuming a standard network efficiency of 50 percent).

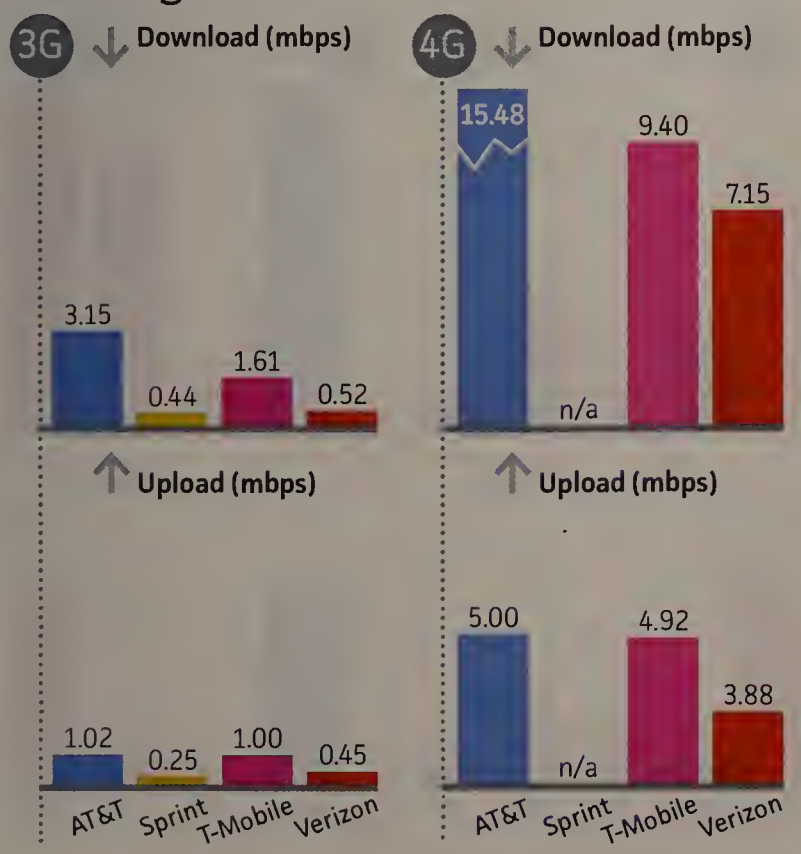
Still, in the cities common to our tests this year and last year, AT&T's 3G download speeds improved only marginally, while its average upload speeds remained almost the same. Between our 2011 and 2012 tests, AT&T 3G had improved considerably, with download speeds jumping from 1.63 mbps in 2011 to 2.83 mbps in 2012.

While AT&T is pushing to move as many of its customers as possible onto its 4G LTE network, the carrier is still maintaining its 3G HSPA+ service. The company says that it will deploy 40,000 small cells and 1000 additional antenna systems nationwide across all networks between now and the end of 2015. That major investment will mean better quality and coverage—for data transfers as well as for traditional phone calls and SMS services—in crowded spaces and indoors.

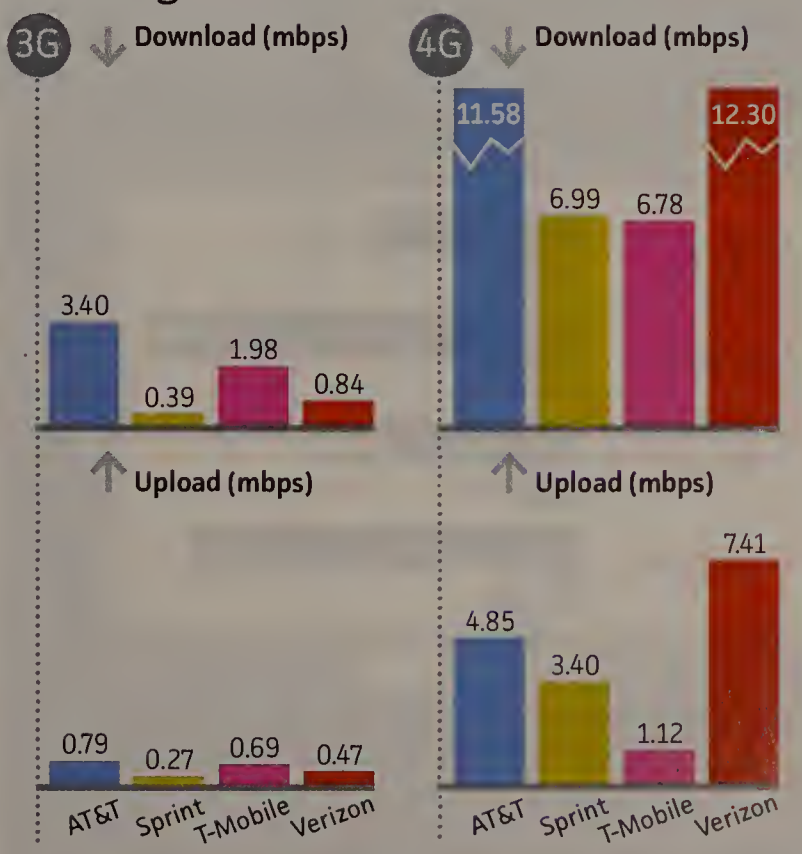
Overall, our tests revealed that AT&T's LTE and HSPA+ services offer the fastest combination of 4G and 3G for dual-mode smartphones and tablets. Relative to Verizon, AT&T got a late start in building its LTE network, so AT&T devices have to downshift to HSPA+ more often than Verizon devices must switch to CDMA. But AT&T users don't see nearly the drop-off that »




## Las Vegas



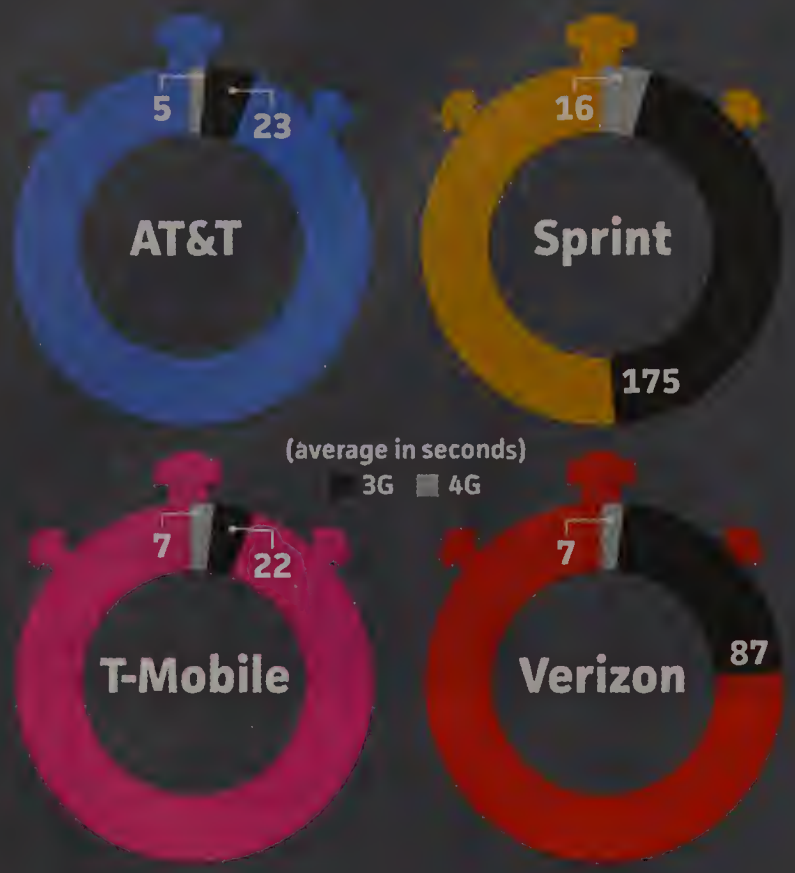

## Los Angeles



# How Fast Are America's Wireless Broadband Networks?

Their speeds affect your daily tasks.

## Time to download a 4.5MB MP3 file




## Time to upload a 7.5MB video

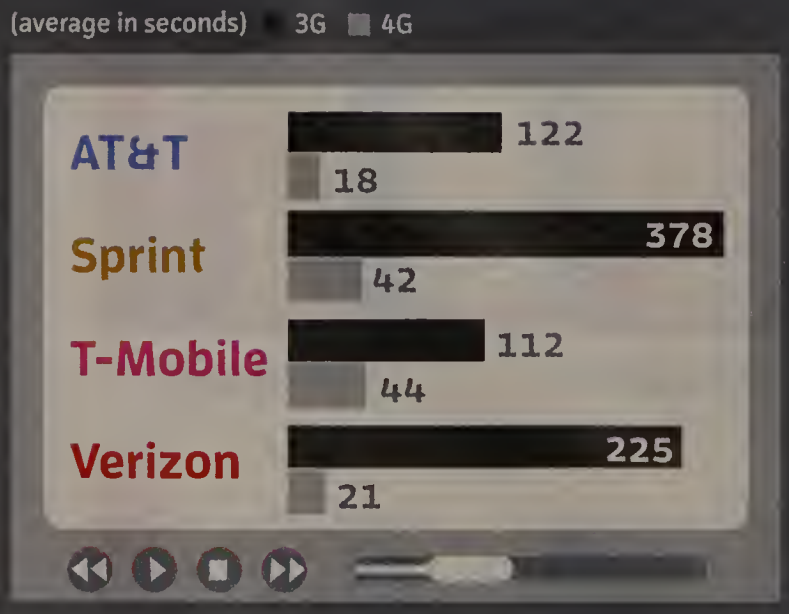



CHART NOTES: Listed T-Mobile 4G scores represent the speed of the carrier's HSPA 42 network and its LTE network where available. MP3-download and video-upload times assume a network efficiency rate of 50 percent.

Verizon subscribers do. The average LTE-to-3G downshift for AT&T users, from 13.15 mbps to 2.97 mbps, represents a 77 percent drop, versus a 92 percent drop for Verizon.

# T-Mobile

## Strong in LTE, and Tops in 3G

Ever since the U.S. government blocked the merger of T-Mobile and AT&T in late 2011, T-Mobile has taken an "if you can't join 'em, beat 'em" attitude. As the smallest of the four major carriers, it has the least to lose from making bold moves.

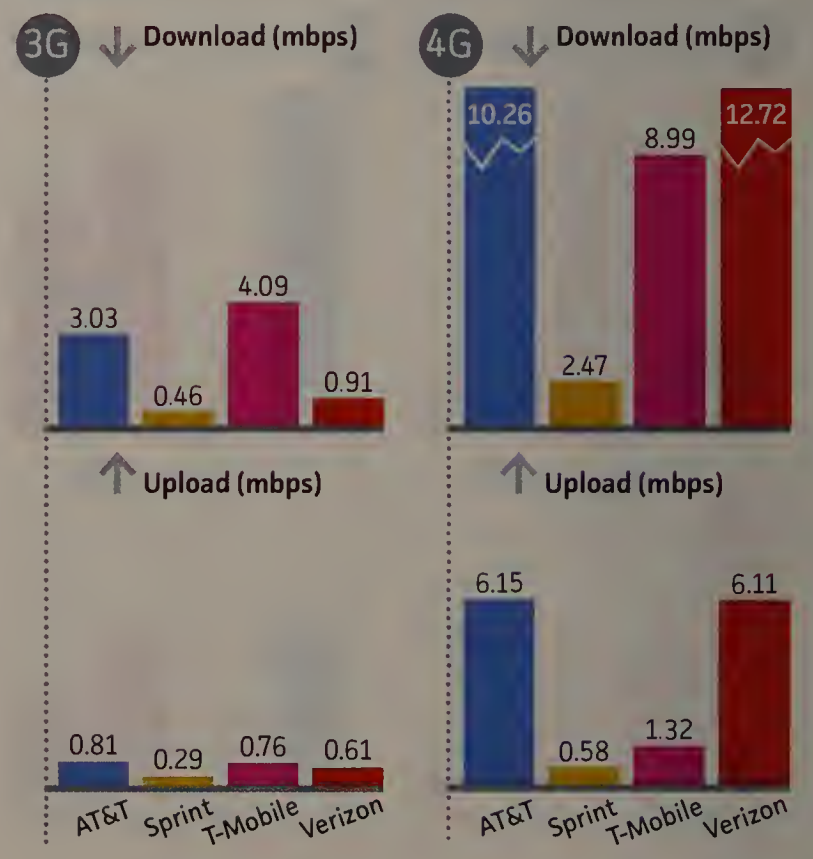
Over the past year, T-Mobile has seen great progress. The carrier had been selling HSPA+ service and labeling it "4G," but in April the company launched an LTE network, which some people consider to be a true 4G technology. The new service is now officially available in Baltimore, Houston, Kansas City, Las Vegas, Phoenix, San Jose, and Washington, D.C., though, as noted earlier, we were able to measure the signal in several other as-yet-unannounced cities.

The iPhone 5 model that T-Mobile began selling in April is fully compatible with the carrier's LTE network, which allows for speeds of 20 mbps or better for customers lucky enough to live in a T-Mobile LTE city. T-Mobile had sold more than 500,000 iPhone 5 units as of early May. The carrier says that it plans to

INFOGRAPHIC: FLYING CHILI

## Performance Results By City

### Miami

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grow out its LTE network to many more cities by the end of this year, coming within range of 200 million people.

"T-Mobile's 4G LTE network rollout is moving at a speed that's unprecedented in the U.S. wireless industry—we'll go from seven metro areas today to nationwide by the end of the year, with many major metros launching [in June]," said T-Mobile U.S. CTO Neville Ray in a statement.

In locations where the LTE network is not yet available, customers can connect with the carrier's HSPA 21 and 42 services. Because of the considerable speed of the HSPA 42 service, we accepted T-Mobile's "4G" designation for it for the purposes of our study, and we pitted that service against the LTE services of the other carriers. T-Mobile's two 4G services—HSPA 42 and LTE—together produced an average 4G download speed of about 9 mbps in our 20 test cities. That score put T-Mobile's 4G in a virtual tie with Verizon LTE for second place in our study.

The carrier's average upload speeds came in at 2.65 mbps, the lowest average for uploads in our four-carrier competition. T-Mobile's service also produced the highest average network latency time in our study, at 124 milliseconds (still responsive enough to support real-time services such as VoIP).

We were able to perform 653 speed tests of T-Mobile's new LTE service in Houston, Kansas City, Las Vegas, Phoenix, San Francisco, San Jose, and Washington, D.C. When we took those results alone into consideration, we saw that T-Mobile LTE had an average download speed of 14.94 mbps and an average upload speed of 6.86 mbps. We also recorded a superlow average network latency of 54 seconds, which suggests a network with very few devices connected to it.

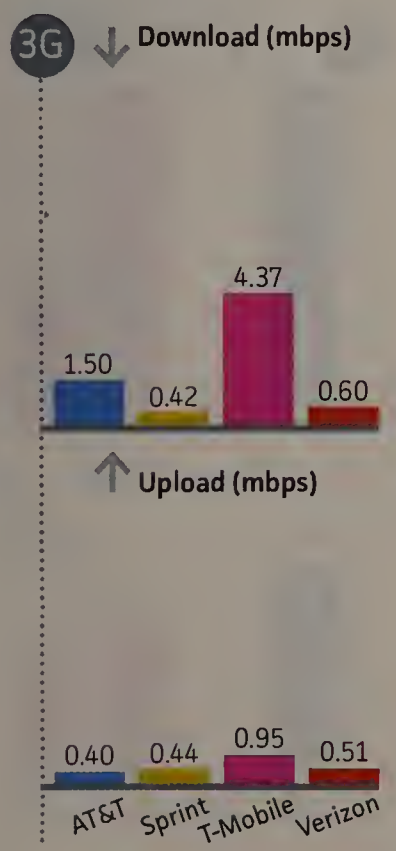
In the 12 cities where we tested in both this year's study and last year's, T-Mobile's overall 4G speeds improved considerably. T-Mobile's download scores in those cities improved from 5.48 mbps last year to 8.73 mbps this year. Upload speeds improved from 1.28 mbps last year to 2.63 mbps this year.

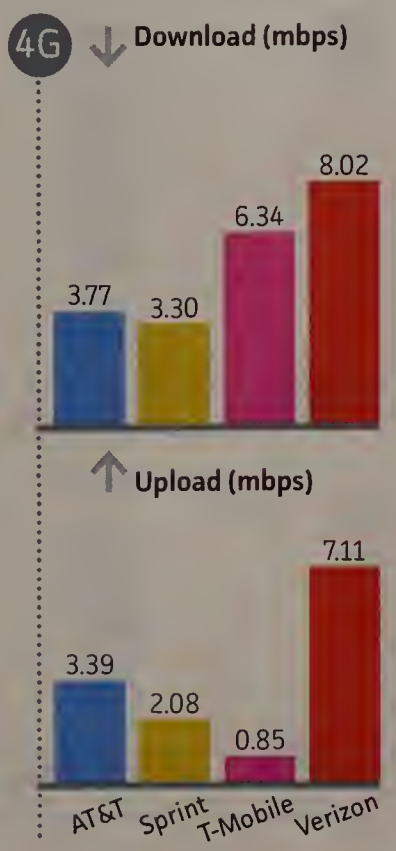
T-Mobile's fastest cities were San Francisco and San Jose, where we measured downloads in the 17.5-mbps region. We also saw fast downloads in Phoenix, where speeds averaged about 14 mbps. In the remainder of our testing cities, however, T-Mobile download speeds failed to break into double digits.

Not only has T-Mobile launched its LTE network, but it has also consistently improved its HSPA network. The company has installed new top-of-the-tower equipment to increase the signal strength in 57 of its markets across the United States, covering more than 170 million people. Its HSPA 21 and HSPA 42 networks are available to 228 million people in 229 metro areas.

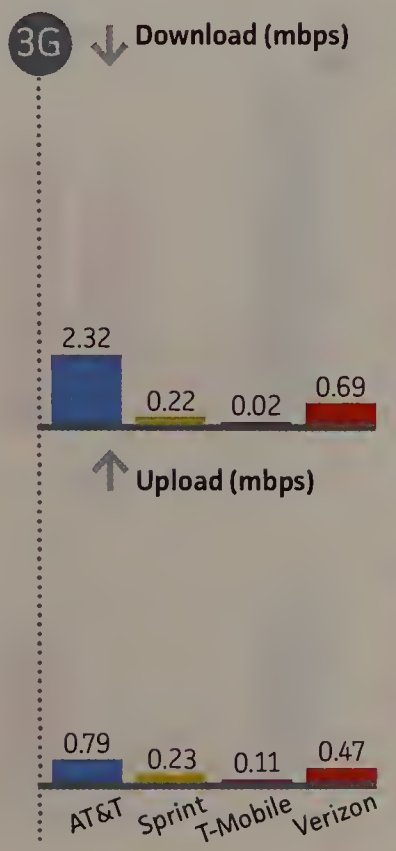
And the speed scores show it. For the second year in a row, T-Mobile's HSPA network pumped out the fastest 3G download and upload speeds in our tests. Using our (HSPA 14.4) Apple iPhone 4S, we recorded average download speeds of 3.13 mbps, and average upload speeds of just above 1 mbps. »

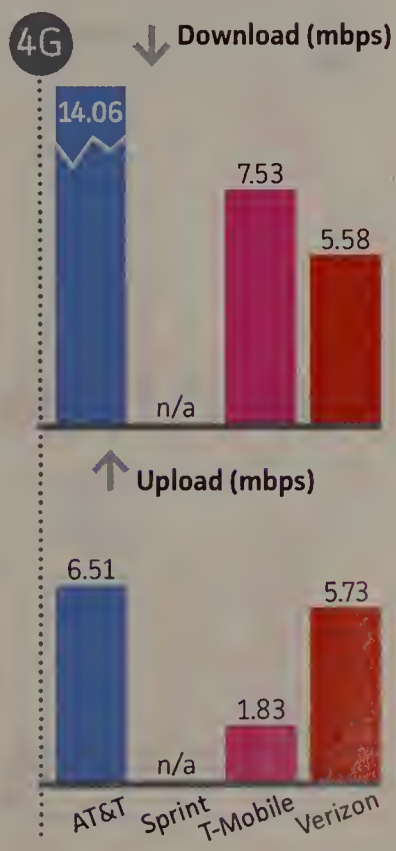
## New York

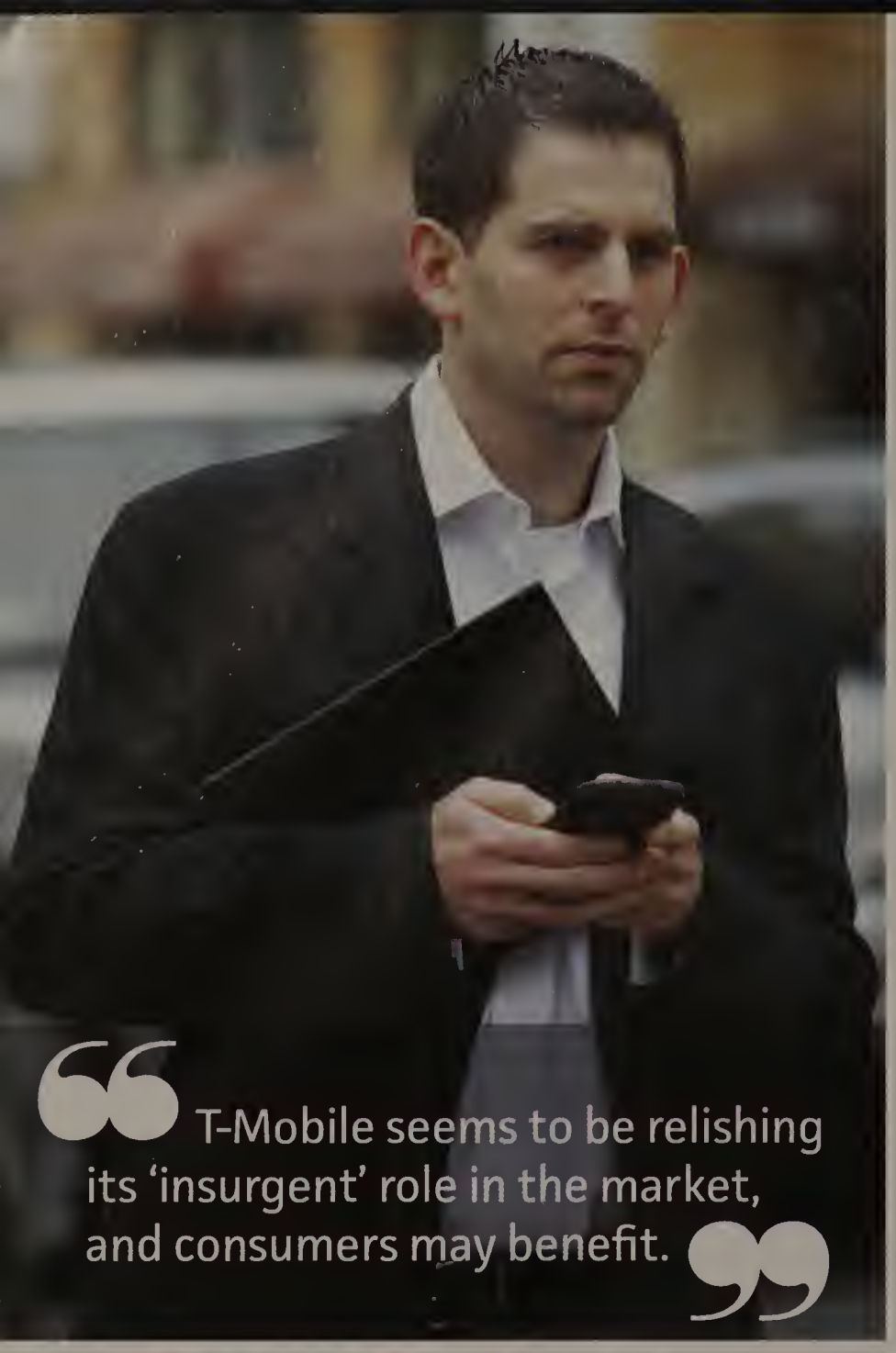



## Omaha





> T-Mobile seems to be relishing its 'insurgent' role in the market, and consumers may benefit.

"In less than a year, T-Mobile has made huge progress on an aggressive $4 billion plan to make our strong 4G [HSPA] network even stronger," says Ray. "We've advanced our network to increase signal strength and improve voice and data coverage, and we've retuned our airwaves to launch 4G HSPA+ services in additional spectrum, 1900MHz, that's compatible with a broader range of devices, including the iPhone 4S."

We recorded T-Mobile's top HSPA speeds in Chicago and in eastern cities, where the service averaged 4.29 mbps. On the flip side, however, T-Mobile's network posted decidedly poor average speeds in some central and western cities. In Omaha, for example, the speed was just 0.02 mbps for downloads, and the service failed to break the 2-mbps mark in Las Vegas, Los Angeles, Phoenix, and San Diego.

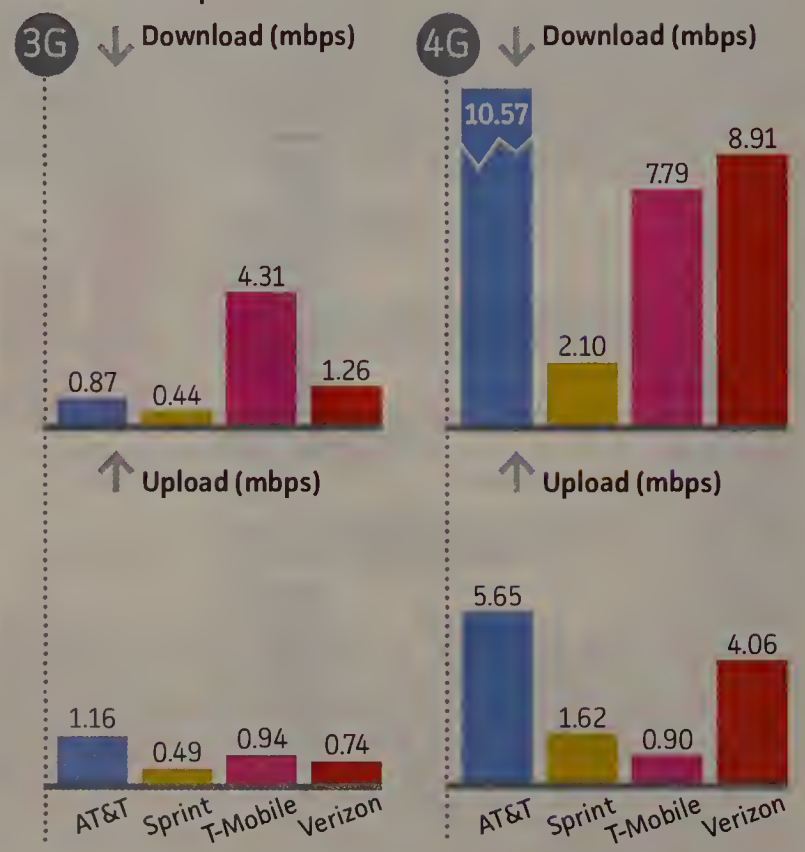
Upload speeds were nothing special, amounting to less than 1 mbps in half of our testing cities. Average upload speeds also fell year-over-year in the cities common to both this year's study and last year's tests.

T-Mobile users whose LTE devices downshift to HSPA should find the speed reduction tolerable. Its drop-off of 62 percent (from an average 4G download speed of 9.01 mbps to an average HSPA speed of 3.13 mbps) was the least of all the carriers.

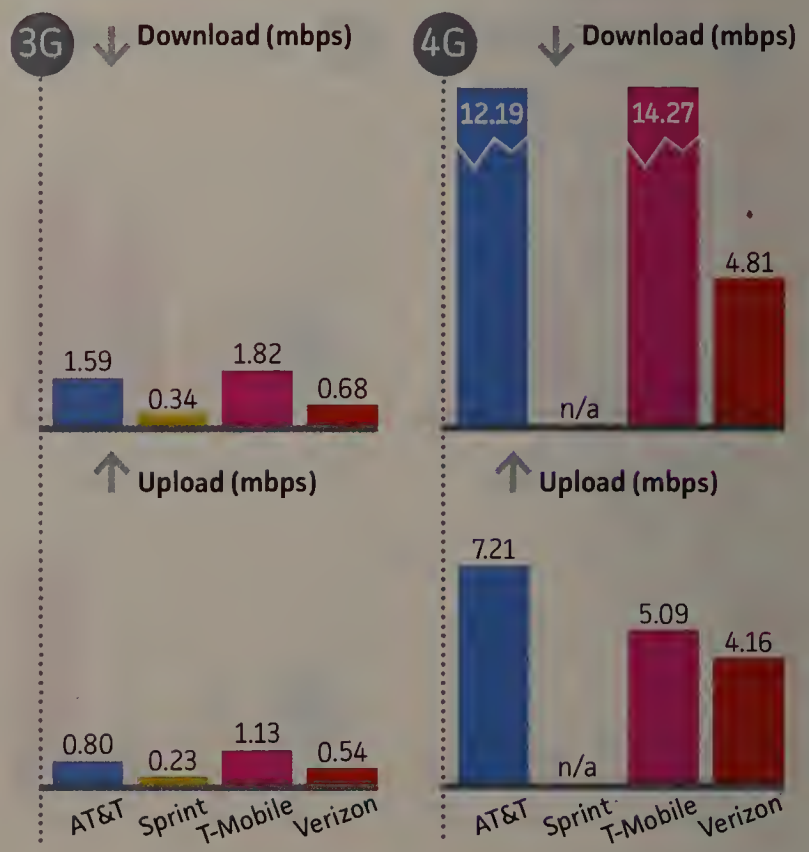
While it's beginning to expand the construction of its LTE networks, T-Mobile is still trying to compete with the larger carriers by pushing up the speeds of its HSPA service to 4G-like

## Performance Results By City

### Philadelphia




### Phoenix



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levels, and by selling its service plan and device bundles at lower prices. T-Mobile appears to be relishing its "insurgent" role in the mobile market, and consumers may benefit.

# Verizon

## LTE Keeps Pace, but 3G Underwhelms

Verizon Wireless didn't post the fastest LTE speeds in our study, but it does have the largest and most robust 4G LTE network in the country. The carrier seemed to announce expanded coverage in new cities almost weekly between May 2012 and May 2013, and now offers LTE in 497 U.S. cities. LTE service is available in roughly 95 percent of the carrier's 3G coverage area.

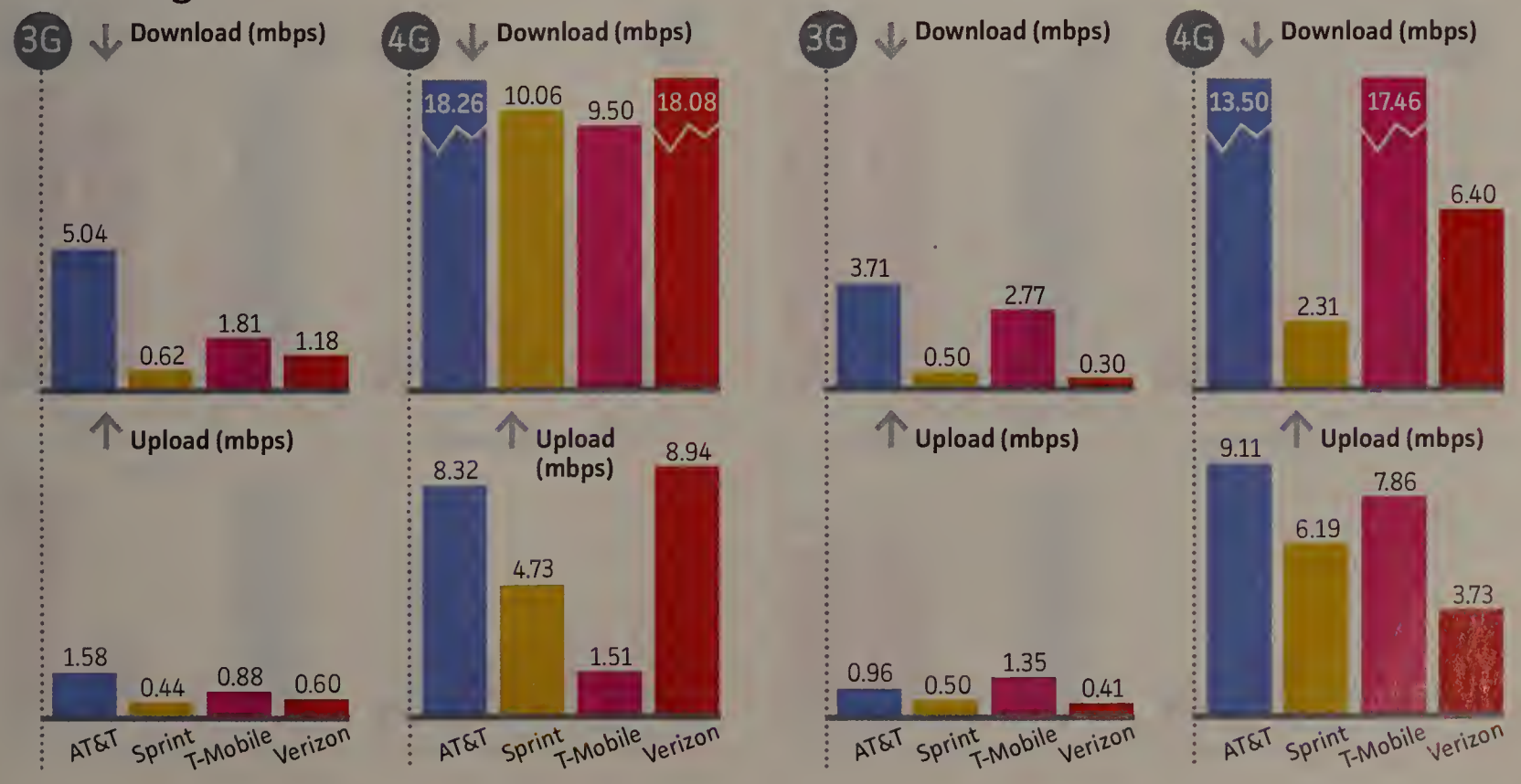
Verizon's contention is that although wireless speeds are important, the breadth of the LTE coverage is more critical. Verizon's LTE speeds may not be the highest everywhere, the company says, but the network is fast enough for the tasks that mobile users want to do, and it allows them to perform those tasks as they move from the city centers out into the suburbs or to less-populated areas of the country.

"There are many ways of testing performance, yet not all are valid or tell the whole story. It's important to recognize that the customer experience depends more upon consistent speed," Verizon reps said in a statement responding to our test results. "Additionally, it's important to recognize that reliability, accessibility, and coverage...are most meaningful to customers."

Obviously, however, speed remains important, especially if you are a Verizon customer who wants to stream video or run video chats. In recent years, some industry observers wondered whether Verizon's LTE speeds would diminish as more and more devices connected to the network since its launch in late 2010. According to Verizon's most recent quarterly earnings report, 61 percent of Verizon's users currently have smartphones with data plans, with 28 percent being on the company's LTE network. In addition, LTE subscribers are using 54 percent of Verizon's total data, an increase over last year.

But our results from this year's study suggest that Verizon's LTE service has been gaining speed, not losing it. Verizon's LTE registered a healthy 9.61-mbps average download speed across our 20 testing cities, an improvement of roughly a third over the service's scores in last year's tests. That average speed falls comfortably within the range Verizon tells its LTE customers to expect: 5 to 12 mbps. The service's tested upload speeds exceeded the range the carrier promises (2 to 5 mbps), clocking in at 5.47 mbps on average.

We recorded the fastest Verizon LTE speeds in San Diego and Seattle, where we measured average download speeds of roughly 18 mbps and upload speeds at a solid 8 mbps. Verizon's scores in those two cities were about twice as fast as »



T-Mobile's 4G results in those areas, but slightly less than AT&T's speeds. Verizon LTE service also pumped out download speeds in the midteens in Denver and Kansas City.

We encountered the slowest performance of Verizon's LTE network in Washington, D.C. (2.24-mbps downloads and 3.69-mbps uploads). Verizon was also slow relative to AT&T and T-Mobile in Atlanta (4.81-mbps download and 4.10-mbps upload) and Phoenix (4.81-mbps download and 4.16-mbps upload).

Currently Verizon has 20 LTE smartphones and six LTE tablets in its stores. Between January and April, Verizon gained 5.9 million new LTE-device activations, with about 2 million of those being iPhone 5 activations. (Although 4 million iPhones in total were activated, only the iPhone 5 is compatible with Verizon's LTE.)

As for 3G service, Verizon does not declare publicly how much it spends on its CDMA network, but its executives say that the company intends to maintain the current network's performance until it can move all of its subscribers to its LTE network.

Verizon 3G service averaged 0.80 mbps (800 kbps) for downloads and 0.52 mbps (520 kbps) for uploads, on average, in our 20 test cities. Average download speeds broke the 1-mbps threshold only in Dallas, Denver, Kansas City, Philadelphia, San Diego, and San Jose. The service clocked its lowest average download speeds in San Francisco, coming in at a sluggish 300 kilobits per second. Downloading an MP3 file at that rate would take almost 4 minutes. Verizon 3G upload speeds clustered around the 500-kbps mark for the majority of our test cities.

Verizon's 3G seems to have slowed somewhat over the past year, too. Its download speeds broke the 1-mbps mark (reaching 1.05 mbps) in last year's study, when we tested using the HTC Droid Incredible. But when we tested in the same cities this year with an Apple iPhone 4S, the network averaged only 0.72 mbps. Average upload speeds also edged down in those cities, from roughly 0.73 mbps last year to 0.54 mbps this year.

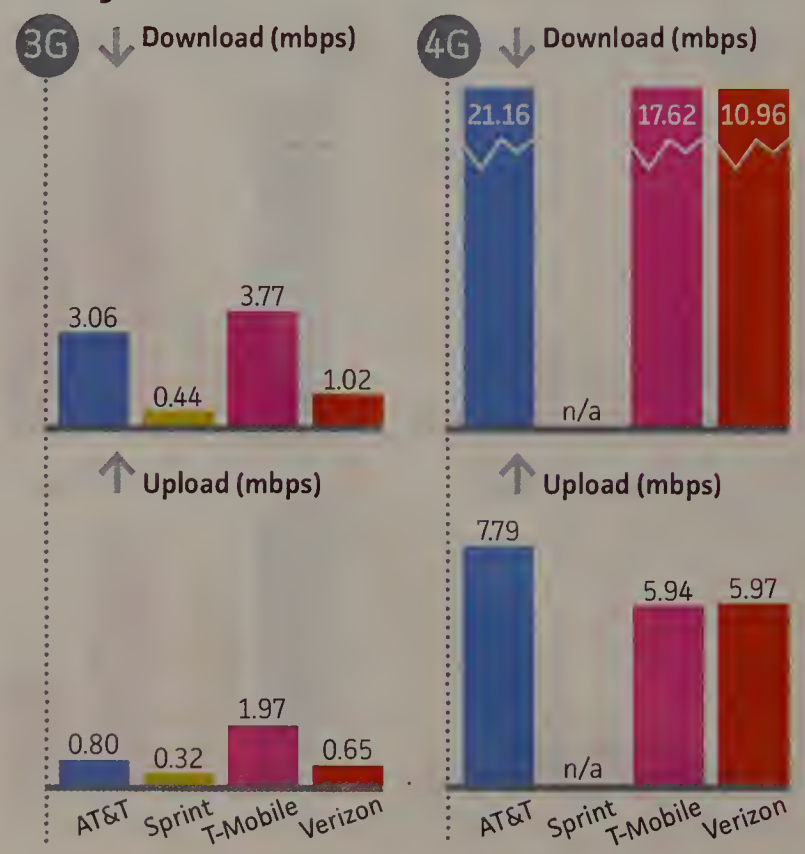
Nevertheless, the scores we recorded this year were within the range of what Verizon tells its 3G customers to expect—download speeds of between 0.60 mbps and 1.40 mbps, and upload speeds of 0.50 to 0.80 mbps.

Verizon's 3G CDMA network, which covers a huge portion of the United States, provides the data service for about 70 percent of the carrier's subscribers. Verizon says it continues to add cell towers to boost signal strength and to keep rural areas connected, especially in areas where 4G LTE is not yet available.

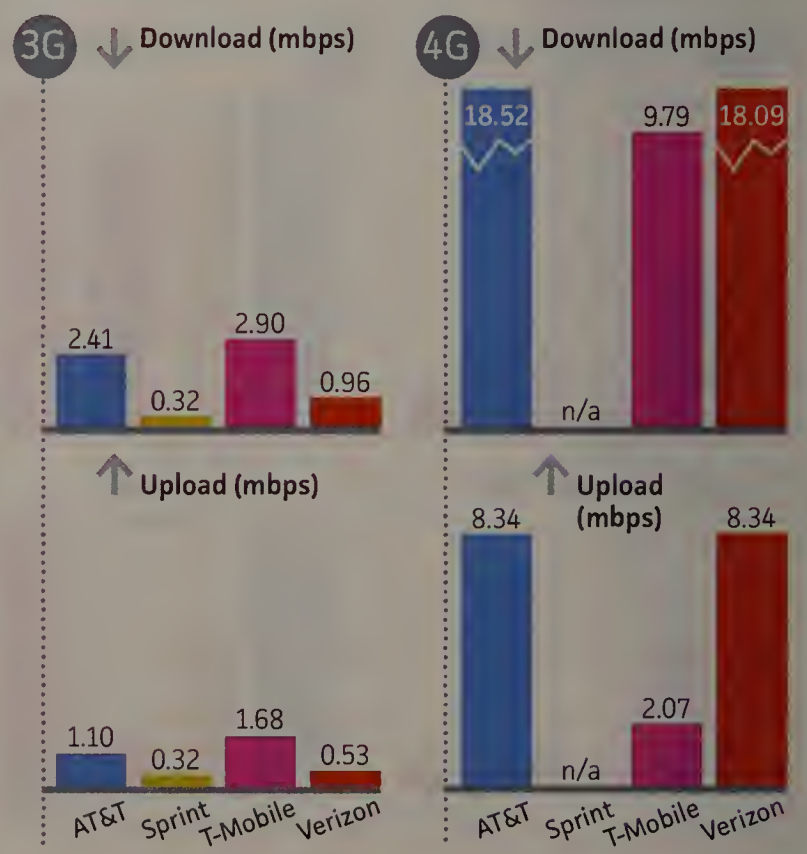
With Verizon LTE service now accessible to 287 million Americans, the newer network is generally more available as one travels outward from densely populated urban areas. As a result, Verizon LTE devices don't have to downshift to the 3G CDMA network as often as AT&T users must switch to that carrier's HSPA+. But the average downshift for Verizon subscribers, from 9.61 mbps to less than 0.80 mbps, represents a dramatic 92 percent drop, in contrast to a 77 percent drop for AT&T users.

## **Performance Results** By City

### San Jose, California




### Seattle



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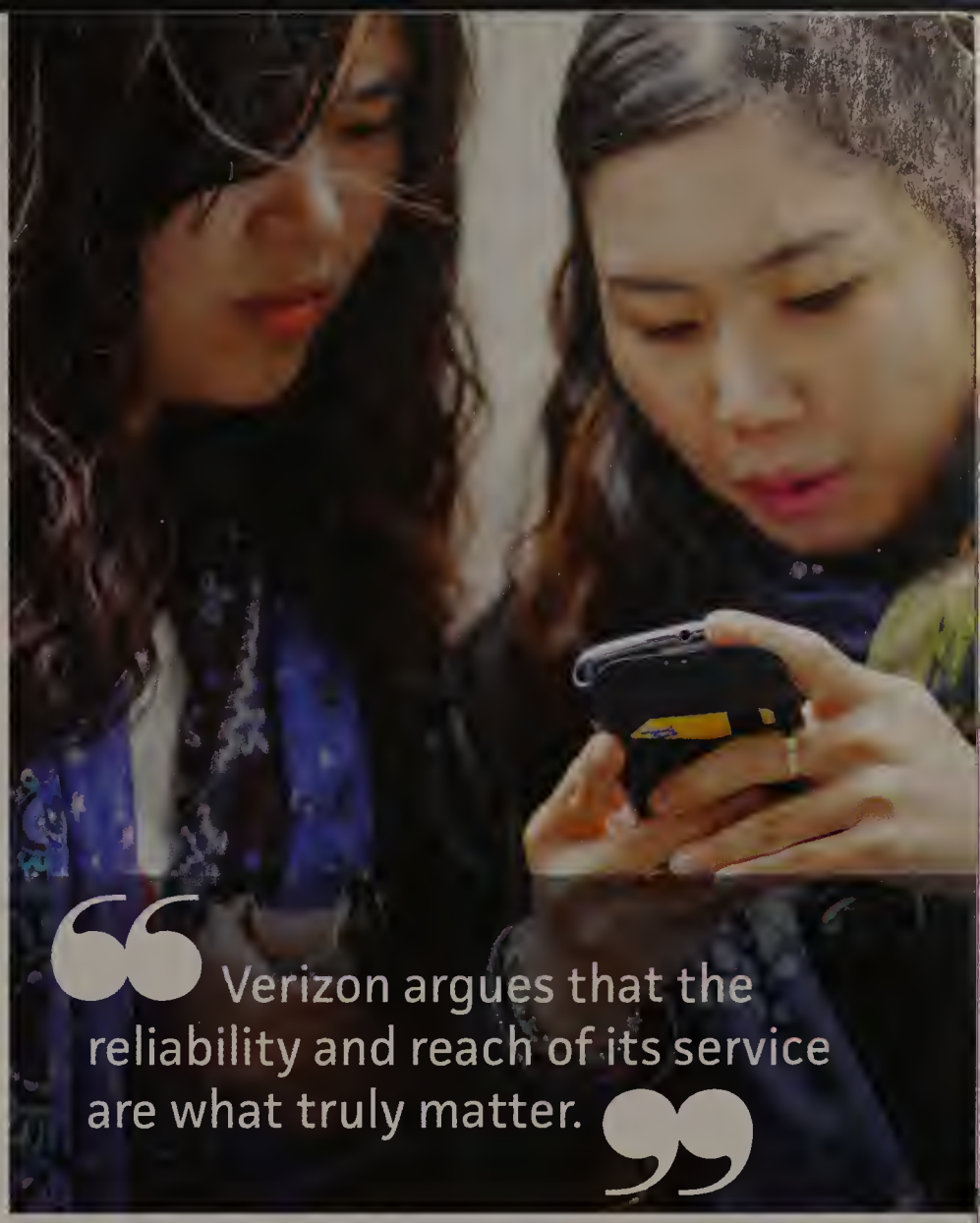
Verizon argues that the reliability and reach of its service are what truly matter. "For us the most important thing is accessibility," says Mike Haberman, Verizon VP of network operations. "Our philosophy is to get everybody on the network; it's not necessarily all about speed."

The company claims that it's seeing more and more of its customer base switching to smartphones as their contracts expire: 61 percent of Verizon's customers currently have smartphones with data plans. Of those, however, the majority are 3G CDMA phones; only 40 percent, Verizon says, are LTE-capable.

Verizon executives have talked about phasing out the company's 3G service within the next decade. But since voice calls are still dependent on CDMA, Verizon first needs to introduce voice-over-LTE service before we will see that 3G phase-out begin. According to Fran Shammo, Verizon's chief financial officer, the company plans to launch its first 4G-only devices as soon as voice over LTE becomes a reality.




# Sprint

## LTE Expands Its Reach as 3G Suffers

Sprint introduced its all-new 4G LTE network in July 2012 and now provides LTE service in 88 markets across the United States. Sprint says that it will add another 170 LTE markets over the next few months. Unfortunately, however, the reach of Sprint LTE seems to be growing faster than its speed.

The carrier says that it's seeing average LTE download speeds of 6 to 8 mbps and average upload speeds of 2 to 3 mbps, but our tests recorded the network at an average of 4.32 mbps for downloads and 2.76 mbps for uploads in the 14 cities where we could connect to the service.

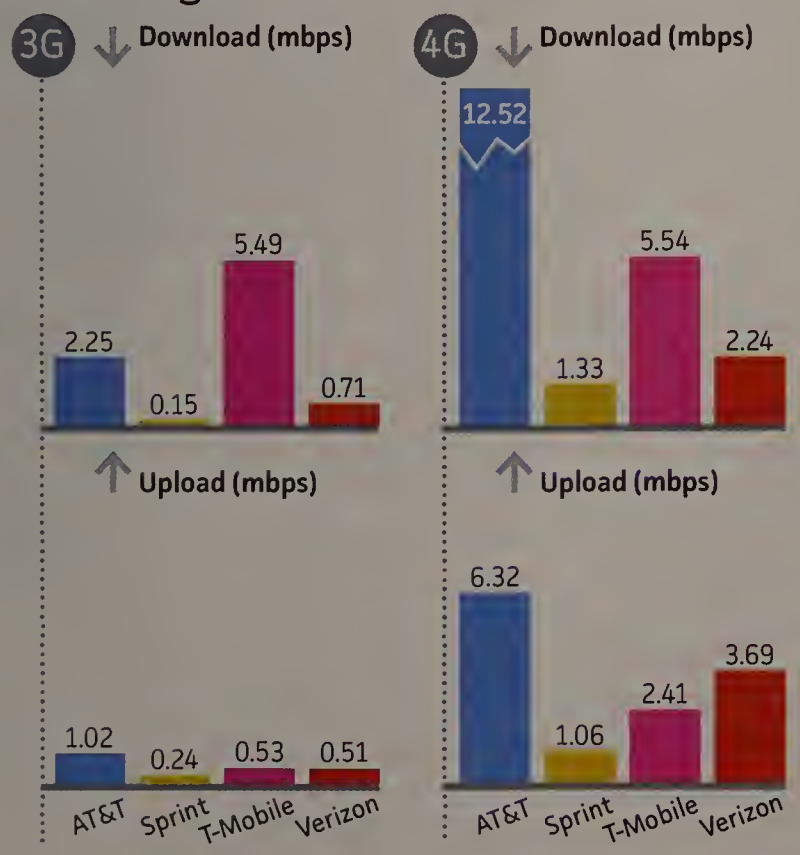
Those averages put Sprint last in our speed rankings for 4G service. In fact, Sprint's average download speed was less than half the speed of the third-place finisher, T-Mobile, and roughly a third of winner AT&T's average download speed.

Of our 20 testing cities, Sprint has officially launched its LTE service in seven: Atlanta, Boston, Chicago, Dallas, Houston, Kansas City, and Los Angeles. But the carrier is testing the service in Ann Arbor, Miami, New York, Philadelphia, San Diego, San Francisco, and Washington, D.C., where we were able to perform enough tests to generate an average score.

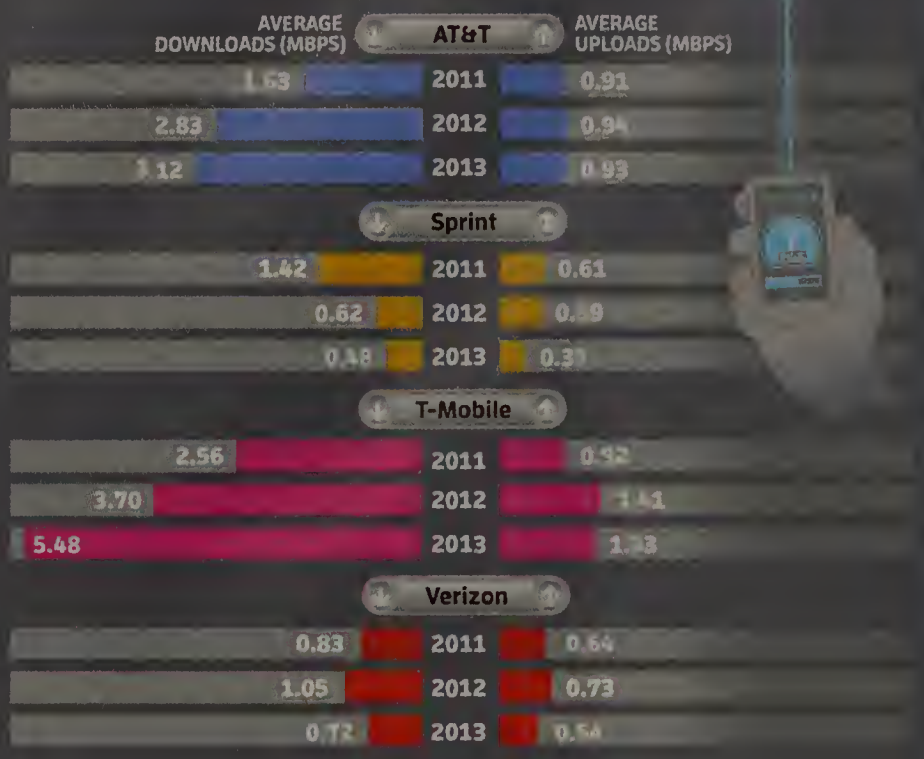
Sprint LTE failed to reach average download speeds of more than 5 mbps in any of the seven eastern U.S. cities we tested. We saw the fastest download speeds from the Sprint network in Kansas City and San Diego, where it averaged about 10 mbps. We recorded download speeds averaging about 7 mbps in Los Angeles, and roughly 5.5 mbps in Chicago and Houston. The rest of Sprint's city averages, however, looked more like the 3G-network speeds of AT&T and T-Mobile.

Sprint says that it is building its LTE network in the suburbs first, and then moving into the city core (where we conducted our testing). This arrangement, the company notes, may account for some of the low scores we recorded. Sprint »

### Washington, D.C.



## HSPA 3G is improving and CDMA speeds are fading...




## ...as 4G continues to ramp up significantly

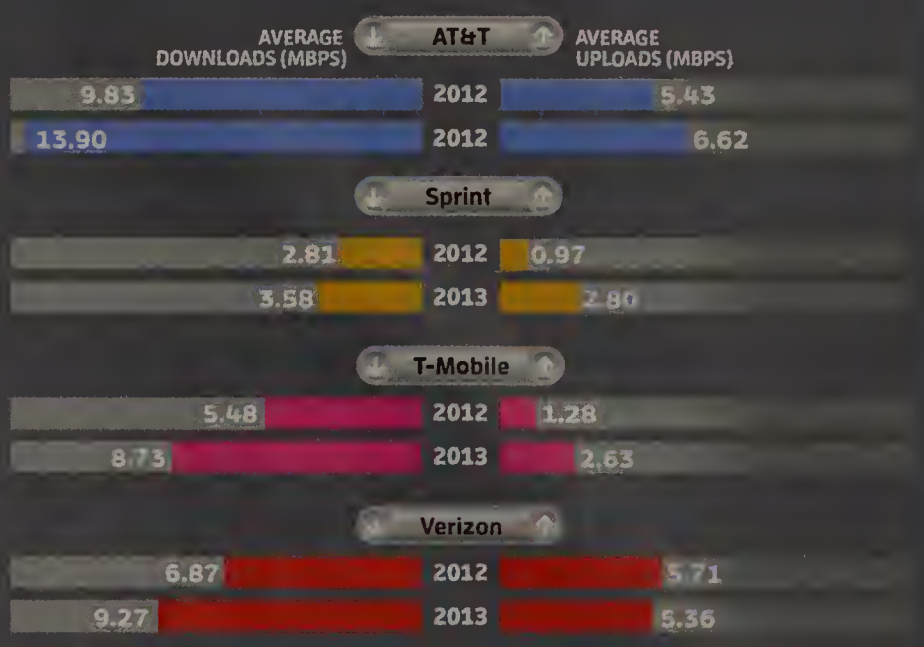



CHART NOTES: For the HSPA and CDMA results, the listed scores represent the average of speeds from the seven testing cities we used in 2011, 2012, and 2013 (Boston, Chicago, Denver, New York, San Francisco, San Jose, and Seattle). The 2011 numbers represent the average of speeds recorded in 160 locations, while the 2012 and 2013 numbers represent the average of speeds recorded in 80 locations. For the 4G results, the listed scores represent the average download speeds in the 12 cities we evaluated for both our 2012 and 2013 tests (Atlanta, Boston, Chicago, Dallas, Denver, Las Vegas, Los Angeles, New York, San Francisco, San Jose, Seattle, and Washington D.C.). Speeds are expressed in megabits per second (1 megabit=1000 kilobits).

spokesperson Kelly Schlageter also points out that the new network is still being built. "The study found LTE signal in six markets that haven't launched, and solid speeds in markets where we have," Schlageter says. "We are not done yet and expect that our customers will benefit from additional improvements as the work progresses."

Sprint's 3G network, the second of two CDMA networks in our study (the other being Verizon's), fared somewhat worse over the past year despite the carrier's well-publicized "Network Vision" improvement plan. The throughput speeds of Sprint's 3G network declined considerably between our 2011 and 2012 studies, and retreated still more in this year's tests. In our evaluations this year, Sprint's 3G service produced dismal average download speeds of roughly 0.40 mbps (400 kbps), and average upload speeds of 0.31 mbps (310 kbps).

"We realize customers may experience slower speeds until upgrades are completed in their neighborhoods, as we are simultaneously operating the old and building the new 3G network," says Schlageter. "In some markets, such as Atlanta and Dallas, the 4G LTE deployment is nearly complete, while 3G work has just begun."

Sprint 3G's worst showings in our study came in Washington, D.C. (150-kbps downloads) and Ann Arbor (190-kbps downloads). The service did not hit average download speeds of greater than 1 mbps in any of the cities tested. Uploads were no better, reaching the 500-kbps mark in only one city, San Francisco.

Downshifting is particularly ugly for Sprint LTE users. When Sprint LTE customers lose the 4G service and fall back to 3G CDMA, their speeds drop by more than 90 percent. Considering Verizon's 92 percent drop-off, that might not seem unusual, but Sprint's drop-off starts from a far lower height than Verizon's, since its average for LTE downloads is only 4.32 mbps and its backup CDMA 3G service averaged a mere 0.40 mbps.

The company claims that 80 percent of its customers have 3G CDMA devices. As part of Network Vision, Sprint is souping up the CDMA network equipment at its sites to increase signal strength, which will result in better data speeds and coverage for 3G devices, the company says.

Sprint claims that the equipment upgrade will also improve voice service, which runs over the CDMA network. The company notes that it began running its CDMA voice service on a new spectrum band (800MHz) in the first quarter of 2013, which it believes will improve in-building coverage as well as reduce dropped and blocked calls.

Despite our test results, Sprint says that the network overhaul is already having positive effects on its 3G service. In Chicago, for example, where the overhaul is nearly complete, Sprint says that its 3G sites are handling about 30 percent more traffic on average, and that download speeds have increased by about 15 percent for sites with upgraded backhaul. ●

INFOGRAPHIC: FLYING CHILI

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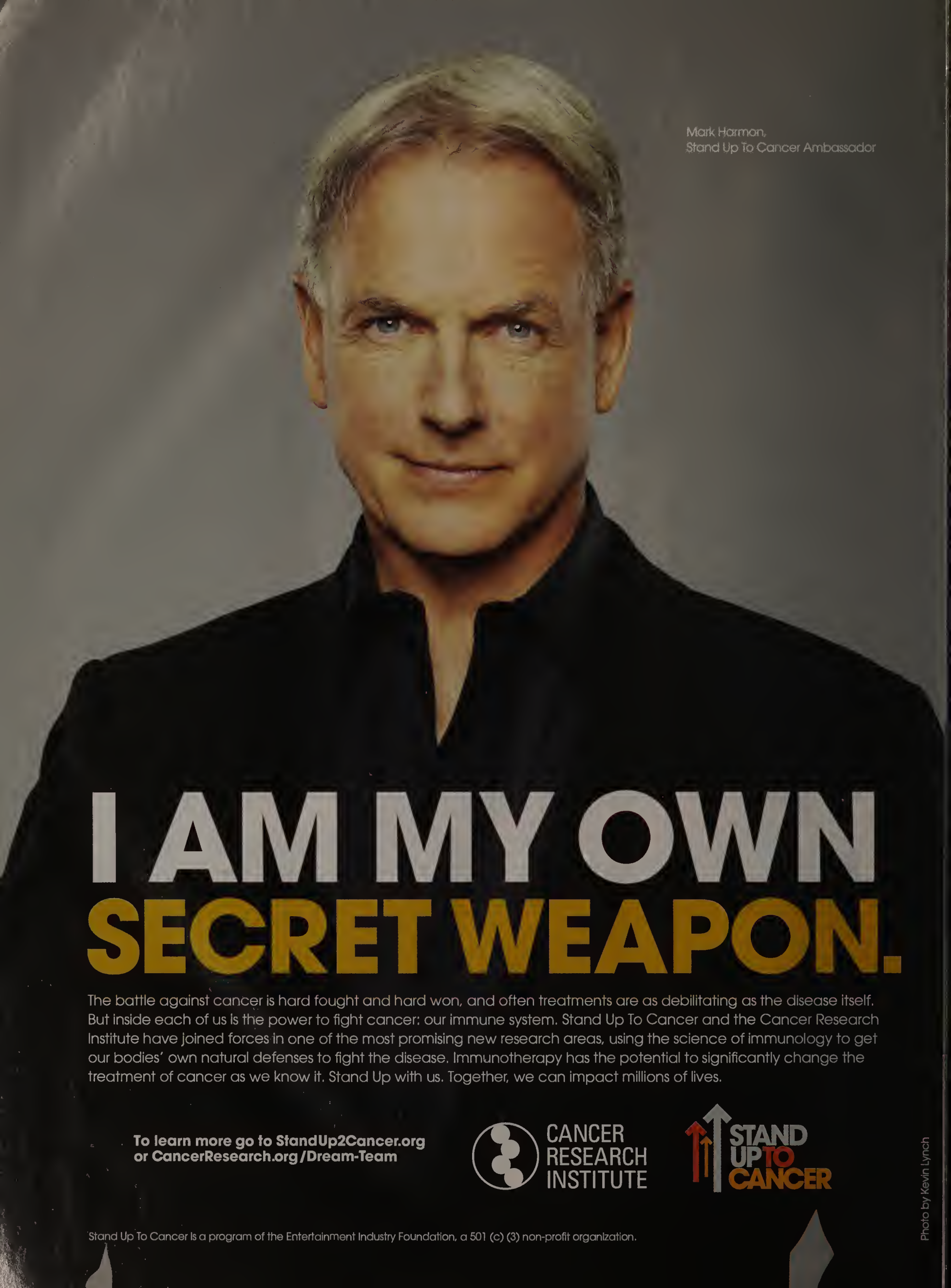


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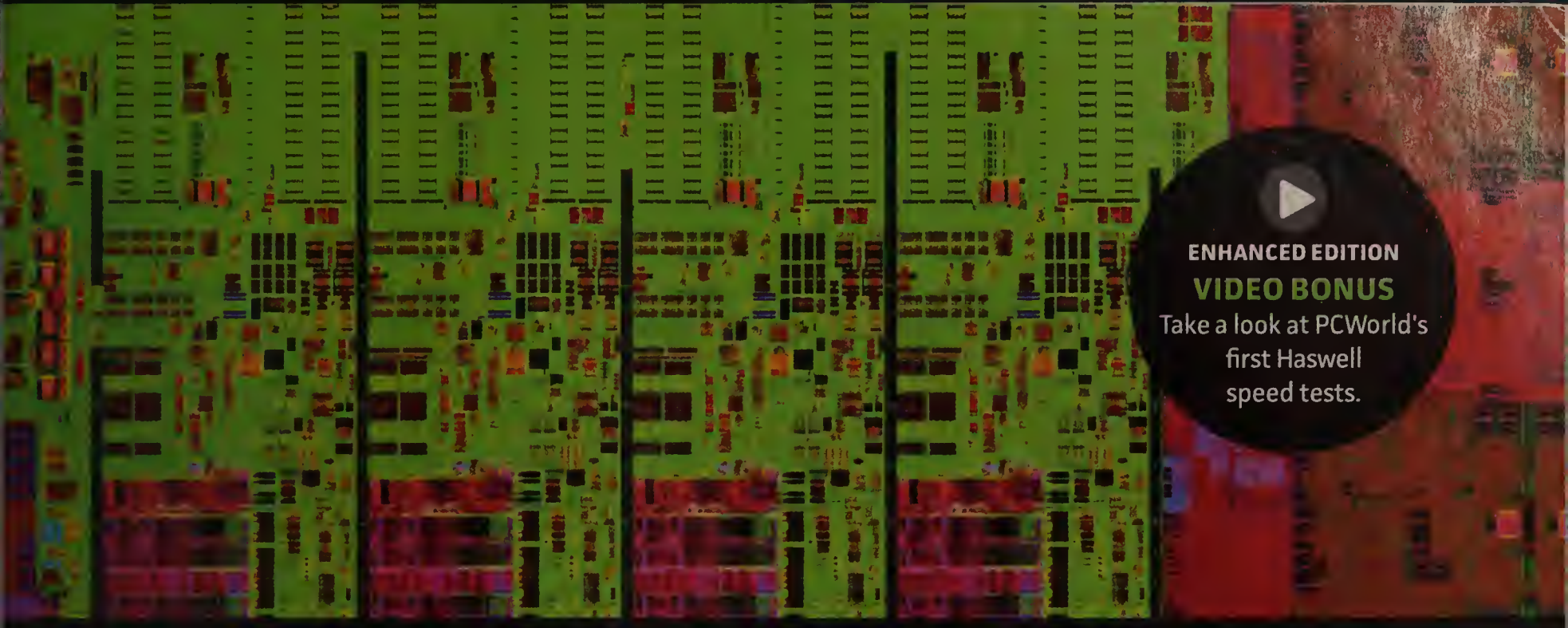
Photo by Kevin Lynch




Intel makes big promises about its all-new CPU.

# HERE COMES HASWELL!

## Does the new chip's performance measure up to the hype? »

BY MICHAEL BROWN

# Intel recently introduced its latest

Core microprocessor technology, code-named Haswell. The new chips address the need for higher performance and lower power consumption. But the real question is this: Will anybody want one?

Although Haswell may be the fourth generation of Intel's Core processor technology, it's the first to enter what many people are calling the post-PC world. Clearly, these days most consumers want smaller, thinner, and more-portable PCs. Smartphones and tablets are great for what they are, but they can't replace the computational horsepower of a genuine PC. There are just too many tasks that tablets and smartphones can't handle, ranging from sophisticated photo and video editing to playing hard-core games.

## Meeting the Challenge

Intel's challenge, then, is to deliver a new CPU family that provides more horsepower than its last, but also consumes less power to deliver longer battery life and lower cooling requirements. This CPU family must support a new generation of PCs—machines with thinner and more innovative designs, systems that prove smartphones and tablets are nice to have but not enough. And that's what Intel promises Haswell does.

Intel is branding Haswell parts using the same three tiers it has used before: Core i3, Core i5, and Core i7. Intel has also introduced new desktop and mobile core logic chipsets, dubbed Series 8. To evaluate how well Intel delivered on its promises, we built out and benchmarked a computer based on the company's brand-new Intel Core i7-4770K. We then compared its performance with Intel's third-generation Core products (code-named Ivy Bridge) and with AMD's best desktop processor, the A10-5800K. We also evaluated two new desktop motherboards that use Intel's Z87 chipset.

Of the major OEMs, HP has announced a few new models that will feature Haswell CPUs, but it hasn't divulged which chips those will be. As of this writing, Acer, Dell, Lenovo, and Toshiba have revealed nothing. The first retail systems to arrive in the PCWorld Labs came from more nimble boutique manufacturers, as we received desktop models from Digital Storm, Micro Express, and Origin, as well as a laptop from CyberPower.

But before we get into all the benchmark numbers, let's examine Intel's overall strategy and then dive into the details of the Haswell microarchitecture.

## Intel's "Tick-Tock" Strategy

Intel describes its product development model using the term "tick-tock." A "tick" occurs every couple of years, when the company implements a new manufacturing process that enables it to pack more transistors into the same silicon real estate. A "tock" is the alternate cycle, when Intel introduces an entirely new microarchitecture.

Intel's Sandy Bridge microarchitecture—introduced in early 2011—was a tock built with a 32nm manufacturing process. The Ivy Bridge series, which arrived in April 2012, marked a tick as Intel moved from the 32nm manufacturing process to a 22nm process. The company will build Haswell chips using this same technology until the next tick, when Intel perfects

## All-New Series 8 Chipset Supports Fourth-Gen Core CPUs

**INTEL has developed a new chipset to support the advanced features in its fourth-generation Core-series CPUs. The biggest changes are related to input/output—the various pathways through which data enters and exits the PC. Intel has also jettisoned support for some old technology, namely the PCI bus. Series 8 includes several chipsets, but here we'll focus on the high-end Z87.**

**A computer using the Series 7 chipset that supports third-generation Core processors can have a maximum of 14 USB ports, but only four can be fast USB 3.0 ports (USB 3.0 can deliver data-transfer speeds up to 4.8 gbps, whereas USB 2.0 maxes out at 480 mbps). The Series 8 chipset also supports 14 USB ports, but as many as six of them can be of the USB 3.0 variety.**

**What's more, all 14 ports are managed by Intel's eXtensible Host Controller Interface (xHCI), which is considerably more power efficient than the previous technology.**

**The next most significant improvement is related to the number of SATA 6Gb/s interfaces that the chipset can support, so it's arguably more important to desktop systems that have multiple hard drives. Whereas the Series 7 chipset could support a maximum of two SATA 6Gb/s ports, the Series 8 chipset can support up to six.**

**In line with the dramatic improve-**

its 14nm manufacturing process. The new CPUs based on that technology will be dubbed Broadwell.

Intel will continue to ship earlier generations of its CPUs, and you might be surprised to learn that some of those earlier chips are considerably more powerful than Haswell. The Haswell parts that Intel has announced have up to four cores, with hyperthreading support. Hyperthreading is an Intel technology that allows the PC's operating system to address one virtual core for each one of the CPU's physical cores.

Intel's Core i7-3930K, i7-3960X, and i7-3970X—desktop CPUs based on the Sandy Bridge-E microarchitecture that predates the 22nm Ivy Bridge—are all hexacore components that support hyperthreading. An operating system running on these CPUs can address a total of 12 cores (six physical and six virtual). Intel designates its absolute fastest CPUs as Extreme Edition CPUs, but the company has not indicated whether it will build Extreme Edition Haswell chips.

## Haswell's Architectural Changes

Intel has introduced four series of mobile processors and four series of desktop processors. The entire family features an integrated voltage regulator that will significantly reduce power consumption while simultaneously eliminating as many as seven other integrated circuits from the motherboard. Intel claims this feature will give laptops 50 percent more battery life.

Intel has traditionally used the term TDP (thermal design power) to specify how much electrical power a computer must be able to dissipate in a worst-case scenario in which the CPU is operating at its maximum speed for a sustained period. Now the company is introducing a new specification, SDP (scenario design power), that indicates how much power a computer must be able to dissipate while being used for media con- »

**Intel** is branding Haswell parts using **Core i3**, **Core i5**, and **Core i7** tiers. It has also introduced the new **Series 8** core logic chipset.

ments in graphics performance that Haswell brings to the table, Intel moved the digital display interfaces (DisplayPort, HDMI, and Wireless Display) from the chipset and into the CPU itself. Fourth-generation Core processors can support three independent displays. They also support DisplayPort 1.2 with multistreaming.

Several of the new features in Intel's Z87 chipset are optional. Smart Connect Technology, for instance, is designed to make PCs more responsive, with speedier boot and return-from-standby times. This feature lets your computer refresh its data—to retrieve email, for instance—while in its low-power standby mode. That way, you not only get longer battery life, but you'll also be more productive because your PC will always have fresh data—you won't have to wait for it.

Intel's Rapid Start Technology enables a PC to return from a deep sleep state, in which it consumes almost no power at all, to a fully functional state almost instantly. This feature is a requirement for Ultrabooks, where it will conserve battery life, but it's also useful in desktop PCs, where it can reduce energy consumption.

PC enthusiasts might also want to check out Intel's Extreme Tuning Utility, a tool that permits you to tweak various parameters that determine how fast the CPU will run. With an unlocked processor such as the Core i7-4770K, you can easily change nearly every setting, from the base clock rate to the clock multiplier and more.

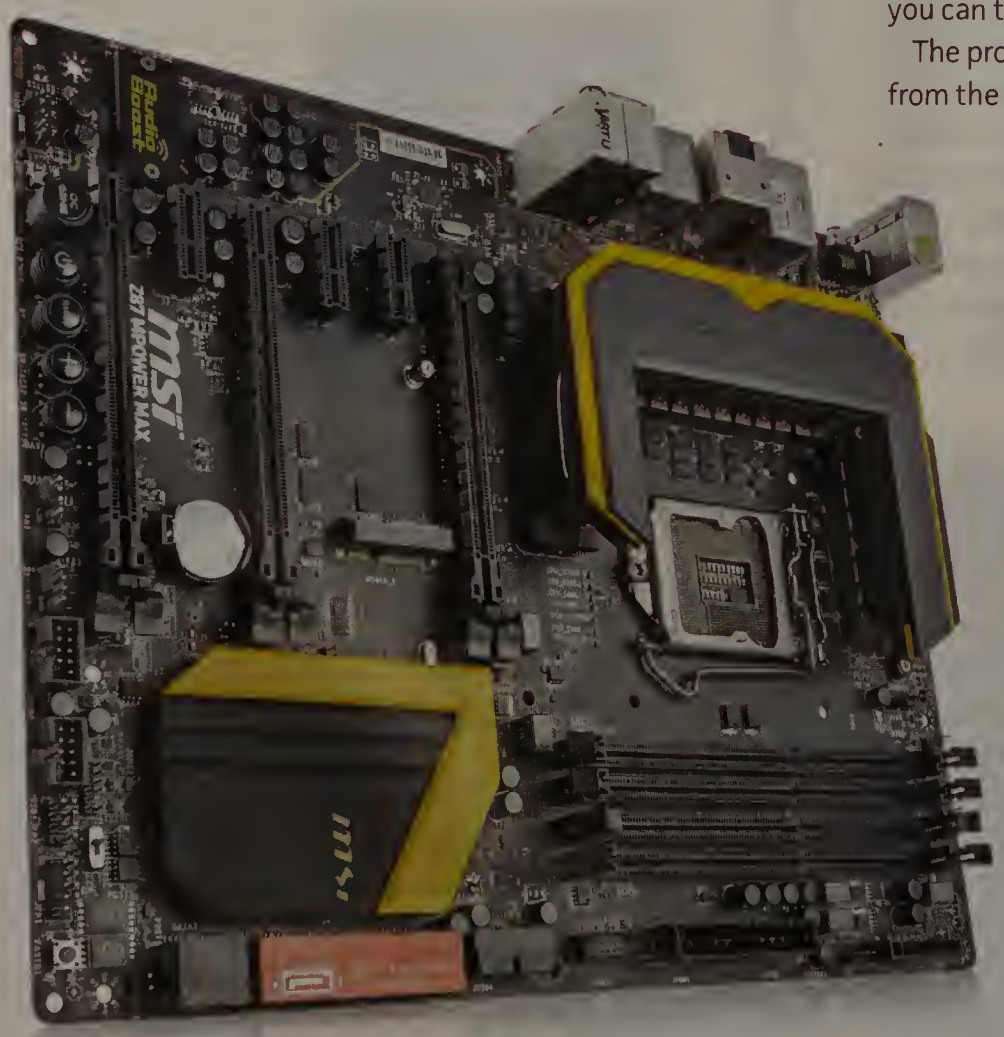
sumption and "light creation." Intel will apply the SDP spec to CPUs powering tablets and notebooks with detachable displays (Intel describes these as "behind the glass" devices).

Mobile Haswell processors with TDPs of 15 and 28 watts (or SDPs of 6 watts or less) feature a Platform Controller Hub integrated into the package. The PCH, more commonly known as the southbridge, handles the computer's input/output functions, such as USB and audio. Integrating the southbridge into the CPU package reduces the size of the motherboard, allowing for smaller and thinner laptop designs that consume less power. These same parts will be capable of operating in a very-low-power state that Intel has dubbed SOix. A notebook in this idle state will consume almost no power, but will wake up to a fully active state within a few hundred milliseconds.

## Intel's New Desktop CPU Lineup

Intel wants everyone's attention focused tightly on its fourth-generation mobile Core product line. But when it came to providing us with samples for benchmarking, the only part Intel provided was a desktop processor.

While that is a curious turn of events, the good news for hard-core gamers, enthusiasts who enjoy building their own computers, and families who want an all-in-one computer is that Intel has no intention of walking away from this market. With all its talk of laptops, tablets, and hybrid convertibles, the company has released details on a dozen new desktop CPUs.




**A DIY upgrade** to Intel's fourth-generation Core processors means buying a new motherboard, such as MSI's high-end Z87 Max.

## But Where Is Iris?

Perhaps recognizing that most desktop PC buyers (aside from all-in-one aficionados) prefer to use a stand-alone video card with a stronger graphics processor from the likes of AMD or Nvidia, Intel has so far unveiled just one desktop CPU with its ballyhooed Intel Iris Pro Graphics 5200 graphics processor: the Core i7-4770R. And that component will be sold only in a BGA package (the initialism stands for "ball grid array," a design for mounting the processor permanently to the circuit board at the factory). You can expect to see this chip in high-end all-in-ones and perhaps in new types of systems, such as tabletop tablets.

The other 11 desktop products (five in the Core i7 family and six in the Core i5 family) use Intel's other new integrated GPU, the Intel HD Graphics 4600. These processors arrive in the more familiar LGA-1150 package, so you can mount them to (and remove them from) a socket on the motherboard. Of these, the i7-4770K and the i5-4670K have unlocked clock multipliers. If you're unfamiliar with the term, it means that you can tweak the CPU to run faster than its factory setting.

The process of overclocking can wring additional performance from the CPU—sort of like tuning your car's engine to produce more horsepower—but pushing it too far can render your system unstable. Unlocked processors are very appealing to PC enthusiasts.

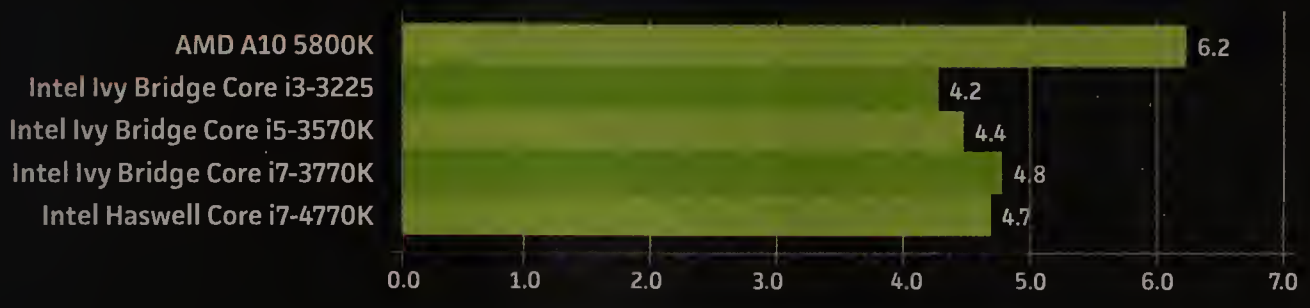
All of the new desktop processors will benefit from the same power-efficiency features found in the fourth-generation mobile Core processors, but they will have higher clock speeds and much higher TDPs, ranging from a low of 35 watts to a high of 84 watts. The aforementioned Core i7-4770R doesn't look to be a wallflower, either, with a TDP of 65 watts and a base frequency of 3.2GHz.

## Benchmark Performance

Intel provided us with its unlocked Core i7-4770K processor and DZ87KLT-75K motherboard to evaluate the processor's performance. We built out the rest of the test bench with 16GB of Crucial Ballistic DDR3/1600 memory (two 8GB sticks), a Cooler Master M2 Silent Pro 80 Plus Silver-rated 1000-watt power supply, and a Kingston HyperX SH103S3 240GB SATA 6Gb/s solid-state drive. For graphics, we relied solely on

PHOTOGRAPH: ROBERT CARDIN

## Power Usage Under Load




**The Core i7-4770K benchmark rig consumed much less power under load.**

## Desktop WorldBench 8.1 Performance

**Haswell was the clear winner in our Desktop WorldBench 8.1 comparison.**

the Intel HD Graphics 4600 hardware integrated into the CPU.

We compared the Core i7-4770K processor's performance (at its stock frequency of 3.5GHz) against a range of Intel's third-generation Core processors: a 3.3GHz Core i3-3225, a 3.4GHz Core i5-3570K, and a 3.5GHz Core i7-3770K. Each of these processors is a quad-core CPU with an integrated Intel HD 4000 graphics processor.

We also compared the Core i7-4770K with AMD's best desktop quad-core processor, the 4.2GHz A10-5800K, which has an integrated Radeon HD 7660D graphics processor. We built out an MSI FM2-A85XA-G65 motherboard using the same memory, power supply, and SSD for our AMD test. Here again, we relied on the AMD CPU's integrated graphics.

Intel's Core i7-4770K claimed first-place finishes on nearly every benchmark, earning a Desktop WorldBench 8.1 score of 347. WorldBench 8.1 is an amalgam of synthetic and real-world benchmark tests designed to provide a holistic look at a computer's performance. It measures graphics-intensive applications such as games, as well as CPU-intensive applications such as photo- and video editing. AMD's A10-5800K limped to a last-place finish in our testing, scoring 197.

But Intel's new processor didn't exactly pummel its predecessor. The older Core i7-3770K delivered a respectable Desktop WorldBench score of 330—meaning it was just 5.2 percent slower than its newer cousin.

And when we measured only gaming performance, running BioShock Infinite at a resolution of 1024 by 768 pixels, with visual quality set to Low, AMD's processor snagged first place, delivering the game at a snappy 54.8 frames per second. Intel's Core i7-4770K performed better than any of its older cousins on this test, but its frame rate of 45.4 fps was more than 17 percent slower than the AMD processor's result.

### Power Efficiency

To evaluate Intel's power-efficiency claims, we measured our test rig's power draw at idle and again while the machine was under load. The Core i7-4770K drew significantly less juice while idle compared to the older Core i7, but only slightly less power than the Core i5 (and insignificantly more than the Core i3). But it was 11 percent less efficient at idle than AMD's CPU.

Perhaps more important, the Core i7-4770k was 24 percent more efficient than AMD's processor while under load. »

## Intel Tightens Its Ultrabook Definition

**INTEL'S new Haswell processors are more than just power-efficient speed demons. They also give the world's biggest name in microprocessors an opportunity to update its Ultrabook specs.**

**An Ultrabook must now be outfitted with a touchscreen, and Intel is encouraging manufacturers to build two-in-one convertible designs (laptops with touchscreens that detach from the keyboards to become tablets). Also, no laptop can be thicker than 23mm if it's to be marketed as an Ultrabook, and it must now be hardware-ready for voice command and control.**

**The company has extended the battery-life requirements, demanding that batteries provide at least 6 hours of HD video playback; a minimum of 9 hours when Windows 8 is idling; and at least seven days of standby time. An Ultrabook must now wake from sleep mode in less than 3 seconds. In addition to supporting wireless networking, an Ultrabook must now also support Intel's Wireless Display technology for streaming its video output to a supported display or adapter.**

**Finally, all Ultrabooks will come with antivirus and antimalware software preinstalled, and will support Intel's antitheft and identity protection technology.**

**It's good to see Intel raising the bar in its definition of the Ultrabook, but many of its new requirements just aren't very challenging. Intel doesn't even demand USB 3.0. And why isn't there a minimum display resolution requirement, or at least an expectation that an Ultrabook will have either Intel's best integrated GPU—the Intel Iris Pro Graphics 5200—or a discrete GPU?**

**HP's Envy TouchSmart 14** fits the new Ultrabook definition.

GRAPHICS

## New Core Series Delivers Much Better Graphics Performance

INTEL IS CLEARLY tired of Nvidia and AMD kicking sand in its face when it comes to graphics performance. It has a talented GPU engineering team. With the fourth generation of the Core CPU line, those engineers finally get to strut their stuff, and Intel has launched a new brand to mark the occasion: Iris.

Intel claims that the Iris Graphics 5100 and Iris Pro Graphics 5200 GPUs integrated into some of its Haswell models deliver as much as twice the 3D performance of its existing integrated graphics processors. Intel also promises 3D performance on a par with that of Nvidia's GeForce GT 650M, a discrete mobile GPU found in high-end notebooks with credible gaming performance.

### Iris and Iris Pro

Iris and Iris Pro GPUs support advanced APIs, including DirectX 11.1, OpenCL, and OpenGL 4.0. DirectX 11.1 is important for delivering the best visual effects in modern games. Photo- and video-editing programs, such as Adobe's Photoshop, use OpenCL to tap a graphics processor so that they can render images faster. Engineering, design, modeling, and animation programs such as Autodesk's 3DS Max rely on OpenGL to talk to the GPU.

In addition, Intel has boosted the performance of the rest of its graphics processors: the Intel HD Graphics 4200, 4400, 4600, and 5000. While all of Intel's integrated GPUs will continue to share system memory with the CPU, the Iris Pro Graphics 5200 will also have access to 128MB of dedicated RAM that will be located on a separate die but in the same package as the CPU.

Iris graphics will be available only on a limited selection of fourth-generation Core processors, however, and they aren't in any of the fourth-generation Core CPUs made for Ultrabooks. The U and Y series CPUs announced to date have Intel HD Graphics 4200, 4400, or 5000 GPUs. The Iris Pro Graphics 5200 is built into Intel's most powerful mobile CPUs—the Core i7-4750HQ, Core i7-4850HQ, and Core i7-4950HQ.

As mentioned earlier, the only announced desktop processor to have the Iris Pro Graphics 5200 is the Core i7-4770R, which comes in a BGA (ball grid array) package designed to be permanently mounted to a circuit board. The balance of the fourth-generation Core desktop CPUs use the Intel HD Graphics 4600.

We ran 3DMark's Firestrike gaming benchmark at a resolution of 1920 by 1080 pixels and found Intel's Core i7-4770K (equipped with an Intel HD 4600 integrated GPU) to be 32 percent faster than its predecessor, the Core i7-3770K. However, the new Intel product was 8 percent slower on this benchmark than AMD's best processor, the A10-5800K. But Intel's chip beat the A10-5800K on nearly all of our other benchmarks.

REVIEW

# Fangbook Offers High-End Gaming

**HASWELL IN ACTION** The Fangbook is a fast but bulky laptop.

MANY NEW LAPTOPS will demonstrate the power-saving elements of Intel's new fourth-generation Core processors, but not the CyberPower Fangbook Evo HX7-200. This sharp-toothed monster is designed for performance with Intel's latest mobile CPU and Nvidia's newest mobile GwPU.

Inside the HX7-200 lies the Intel Core i7-4700MQ, a quad-core chip with hyperthreading support that runs at a base clock speed of 2.4GHz. Intel's M-series mobile processors are a step down from the top-of-the-line H-series models, where you get Intel's new Iris Pro graphics. But if you're a dyed-in-the-wool gamer, you want a discrete GPU anyway. CyberPower obliges by inserting an Nvidia GeForce GTX 780M to help drive this beast's 17.3-inch, 1920-by-1080-pixel display.

## Game Performance

A Notebook WorldBench 8.1 score of 417 indicates that the Fangbook is clearly in a different league. The next-best score of 284 belongs to the Toshiba Kirabook (see page 37), which is powered by a third-gen Core i7-3537U and 8GB of memory.

Although *PCWorld*'s WorldBench suite includes games such as Crysis 3 and Dirt Showdown, I also tried two slightly older action games—Saints Row: The Third and Metro 2033—to form a more subjective opinion. Both played superbly at high resolutions and detail. I noticed no slowdown with either game, but I saw some slight tearing in spots while playing Saints Row.

The PCWorld Labs recorded the Fangbook Evo running Crysis 3 at Ultra quality at an impressive 20.8 frames per second. Running Windows 8 from the 60GB SSD also contributed to this machine's high WorldBench performance.

## Bulky Design

Physically, the Fangbook is on a par with the Alienware M17x: It's not quite the biggest horse in the stable, but it's imposing nevertheless. It measures 16.85 inches wide by 11.34 inches deep and 2.17 inches thick. It weighs in at 10.75 pounds with the power brick and accessories.

The Fangbook's keyboard is conventional enough, but at the top of the screen sit eight "quick start" buttons. Several of them work only after you install a special SCM application that comes inside the box. You can toggle overclocking, a fan boost that cools the notebook, airplane mode, and more.

On the left-hand side of the Fangbook sit two USB 3.0 ports and a USB 2.0 port, plus microphone, headphone, and audio I/O jacks. Two more USB 2.0 jacks hide on the right, along with a DVD±RW drive. HDMI, DisplayPort, and an ethernet jack are mounted on the rear. The notebook includes THX TruStudio Pro for audio enhancement, but the speakers sounded rather flat.

## Few Drawbacks

While the keyboard is relatively comfortable to type on, it feels a bit cramped—somewhat surprising, given that there's more than an inch of extra space at each side.

Also, given that Windows 8 is installed, I couldn't help but paw at the screen when it was time to navigate within apps. That doesn't work, however, as the Fangbook does not include a touchscreen. In fact, the touchpad doesn't appear to support gestures at all, and the touchpad itself isn't clickable.

On the other hand, any gamers worth their salt will use a mouse and keyboard, and the expansive palm rest works fine for both WASD and number-pad control schemes.

## Bottom Line

The Fangbook Evo HX7-200 is one of the first Haswell notebooks out of the gate, so it's too early to tell whether it's the best of the bunch. If you're wondering whether Intel's latest Core processors are worth the investment, the answer is an emphatic yes. Knowing whether this machine is worth its price tag is a tougher question, but it is a solid value.—*Mark Hachman*

★★★★½; $1600; CyberPower; go.pcworld.com/fangbook »

PHOTOGRAPH: ROBERT CARDIN

REVIEW

# MicroFlex 47B Delivers Great Haswell-Powered Performance

THE DESKTOP PC gets a bad rap. It's cheap, dependable, and oh so customizable. It's just not sexy enough to keep the eye of HP, Sony, and the industry's other big players from straying to the mobile market. Even Intel's fourth-generation Core chips, code-named Haswell, are designed with laptops and tablets in mind. But we'll forgive Intel for that, because these new components are faster and more efficient, and they feature better integrated-graphics performance than their Ivy Bridge predecessors had.

However, two of those three enhancements are meaningless to desktop PC buyers. Who cares how much power your PC sucks down? And if you outgrow your video card, you just save the cash for an upgrade, right? Performance today and easy upgrades when you need them are what's really important. That must be why Micro Express chose this flat-black megalith and filled it with delicious components that make up the surprisingly affordable MicroFlex 47B.

## Excellent Specs

The MicroFlex 47B has the distinction of being the first Haswell-equipped desktop PC to come through the PCWorld Labs. It boasts a 3.5GHz Intel Core i7-4770K CPU, 16GB of DDR3/1600 memory, and an Nvidia GeForce GTX 680 discrete graphics card with 2GB of its own. Those components reside on an Asus Z87-Pro motherboard. The operating system is installed on a 512GB Samsung 840 Pro SSD, and the PC has a 1TB, 7200-rpm mechanical drive for storing all your data.

With specs like those, it should come as no surprise that the MicroFlex 47B tore through our Desktop WorldBench 8.1 benchmark suite, settling with a score of 421. That score means it's four times faster than the relatively tame Acer Aspire U desktop machine we've established as our 100-point reference. What we also found remarkable is how quietly it went about humiliating the competition, even while playing the latest PC games with all the quality settings turned up to maximum.

The system was able to churn out BioShock Infinite at 1080p resolution, with visual-quality settings at Ultra, at 78 frames per second. And when we cranked up the game's resolution to our 30-inch monitor's native resolution of 2560 by 1600, it still delivered a respectably rock-solid frame rate of 46 fps.

## Neatly Organized

The MicroFlex 47B's oversize case is easy to get into. You'll find plenty of room inside, and on the motherboard, for storage or expansion. The front has a rewritable Blu-ray drive, a multiformat card reader, four USB ports, and microphone and headphone jacks. The rear panel sports six more USB 3.0 ports, VGA- and DVI-out for the Core i7-4770K's integrated graphics processor, eSATA, gigabit ethernet ports, six optical jacks, and a pair of antennas.

## Bottom Line

You don't get a lot of gonzo features on the MicroFlex 47B. What you do get is quietly phenomenal performance for a very reasonable price tag.—*Alex Wawro*

★★★★½; $1600; Micro Express; go.pcworld.com/flex ●

**HASWELL IN ACTION** The MicroFlex 47B sped through our benchmark tests.

PHOTOGRAPH: ROBERT CARDIN

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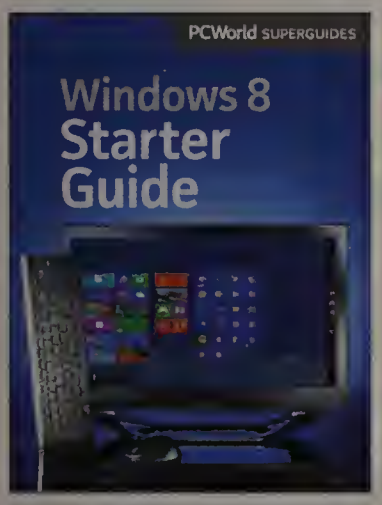


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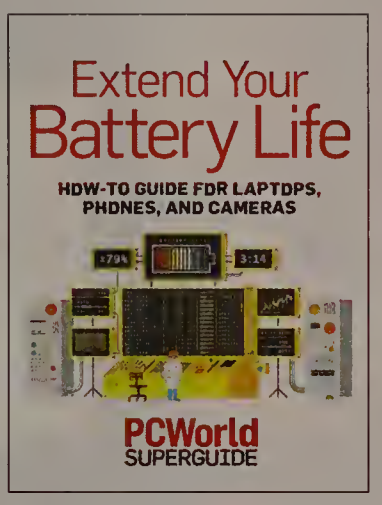


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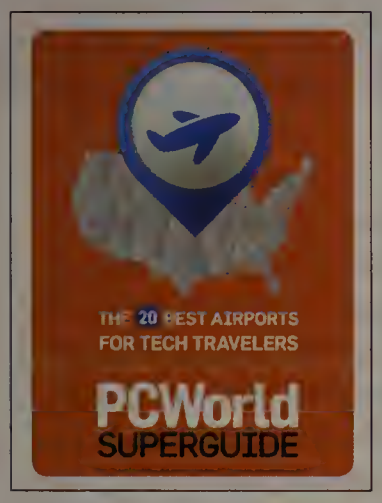


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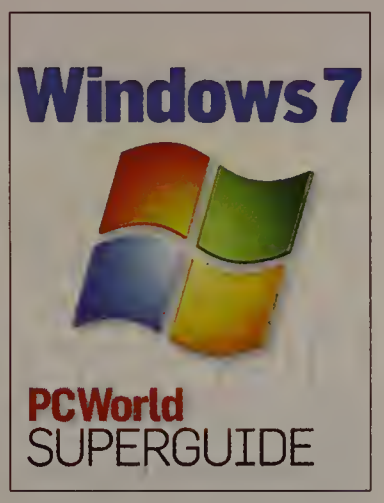


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# Here's How

# The Ubuntu Guide for Displaced Windows Users

**BY CHRIS HOFFMAN**

**Scared of Windows 8 and thinking about switching to Linux? Here's the definitive guide to making the transition.**

THERE HAS NEVER been a better time to take Linux for a spin. With Windows 8 promoting a "touch-first" desktop interface—Microsoft's words, not ours—and with Valve's Steam on Linux bringing much-needed games and popular attention to the often-overlooked operating system, some Windows users might consider other options.

Dipping your toes into the penguin-filled waters of the most well-known open-source ecosystem is easy, and you don't have to commit to switching outright to Linux. You can install it alongside your current Windows setup, or even try it without installing anything at all.

Ubuntu is the most popular Linux distribution for desktop and laptop Linux users, so we'll focus on Ubuntu throughout this guide. For the most part, Ubuntu just plain works. It sports a subtle interface that stays out of your way. It enjoys strong support from software developers (including Valve, since Steam on Linux officially supports only Ubuntu). And you can find tons of help online if you run into problems.

## Install Ubuntu

To get an idea of how Ubuntu works and what it looks like without committing to anything, you'll need to create your own Ubuntu boot device.

To do this, get an Ubuntu disc image from Ubuntu's site (www.ubuntu.com). After downloading the ISO file, right-click it, and then burn it to a writable CD or DVD. If you'd rather put Ubuntu on a USB drive, first look over our guide to this procedure (go.pcworld.com/linuxusb).

After creating an Ubuntu disc or USB drive, insert it in your PC and restart the system. The machine should automatically boot into the live Ubuntu environment. At this point, you can play around with Ubuntu without installing anything on your computer—though it will run slower—or you can move on to installing it. If you install Ubuntu alongside Windows, you'll see a boot menu that asks you to choose the operating system whenever you boot the PC.

To install Ubuntu easily, use Wubi, the officially supported Windows Ubuntu Installer. Wubi lets you install the OS from within Windows, just as you would any other program.

You'll be able to boot into Ubuntu when you start your computer. But because it stores its files in the Windows file system instead of in dedicated Linux partitions, Ubuntu won't run as quickly in this setup as it would by itself. That's something to keep in mind if you plan to play demanding games or use Ubuntu all the time. On the other hand, Wubi makes uninstalling Ubuntu easy—you do it directly from the Windows Add/Remove Programs control panel.

## Don't Dig for Drivers

If your hardware is properly supported (as most contemporary PC hardware is), Ubuntu should work fine out of the box. Everything necessary for using it is included in the base operating system. You don't have to hunt down driver-installation packages on your PC maker's website, as you do with Windows.

The only exception involves advanced video drivers. If you have an Nvidia or ATI card, Ubuntu may prompt you to install your manufacturer's graphics drivers for maximum 3D graphics performance. Even then, you can complete the process in a few clicks.

## Load Up on Software

Ubuntu comes with quite a bit of preinstalled software, including the Firefox browser and the LibreOffice productivity suite. To install additional applications, open the Ubuntu Software Center—click the shopping-bag icon on the dock at the left side of your screen—and search for the type of software you want. The Ubuntu Software Center is full of free, open-source programs compiled for Ubuntu, as well as some commercial applications available for a small fee. The center acts as a user-friendly front end to Ubuntu's software management tools, which you can also access from other applications or with terminal commands.

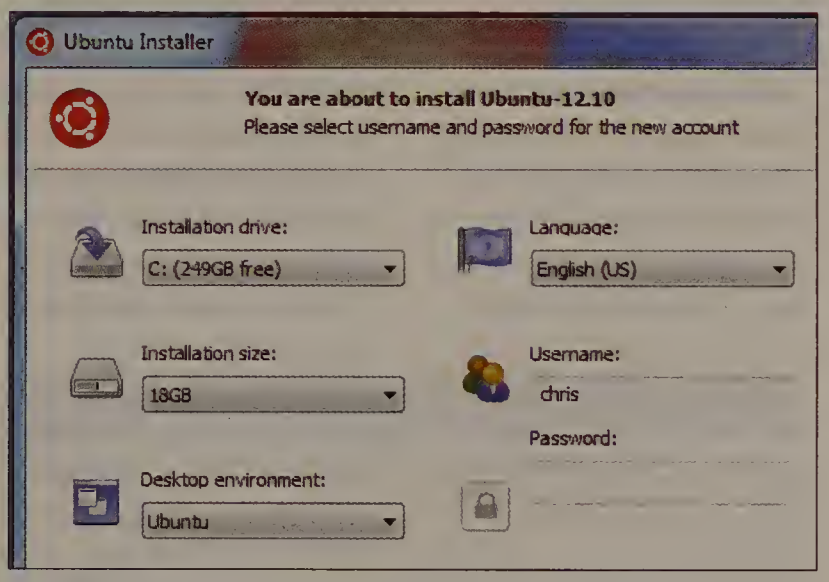
A few applications that you might want to use, such as Google Chrome and Steam, aren't in the Ubuntu Software Center. You can pick up those programs from their associated websites (Google's Chrome website or Valve's Steam website), downloading them as .deb files. Double-click a .deb file, and Ubuntu will prompt you to install it.

Unlike with Windows, where every application must include its own updater, standard software-management tools handle all updates on an Ubuntu system. When updates are available in Ubuntu's repositories, the Software Updater will appear. When you install third-party software like Google Chrome, the source of the application adds its own software repository, and updates will appear in the Software Updater.

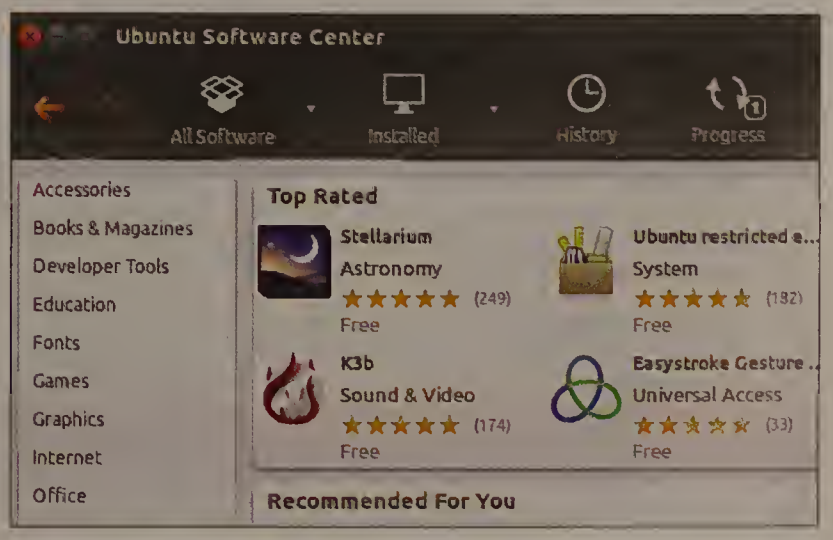
## Use the Unity Desktop

Ubuntu's default desktop environment, named Unity, is one of many possible desktops you can use. Linux lets you experiment with different options until you find the one that's right for you. Here are the main Unity features.

**The dock:** Unity should feel very familiar to users of Windows 7. A Windows 7–style taskbar (known as the *dock*) appears on the left of the screen. Like the Windows »




**Wubi** makes it easy to install Ubuntu on top of Windows.




**Ubuntu Software Center** holds a slew of apps, most of them free.

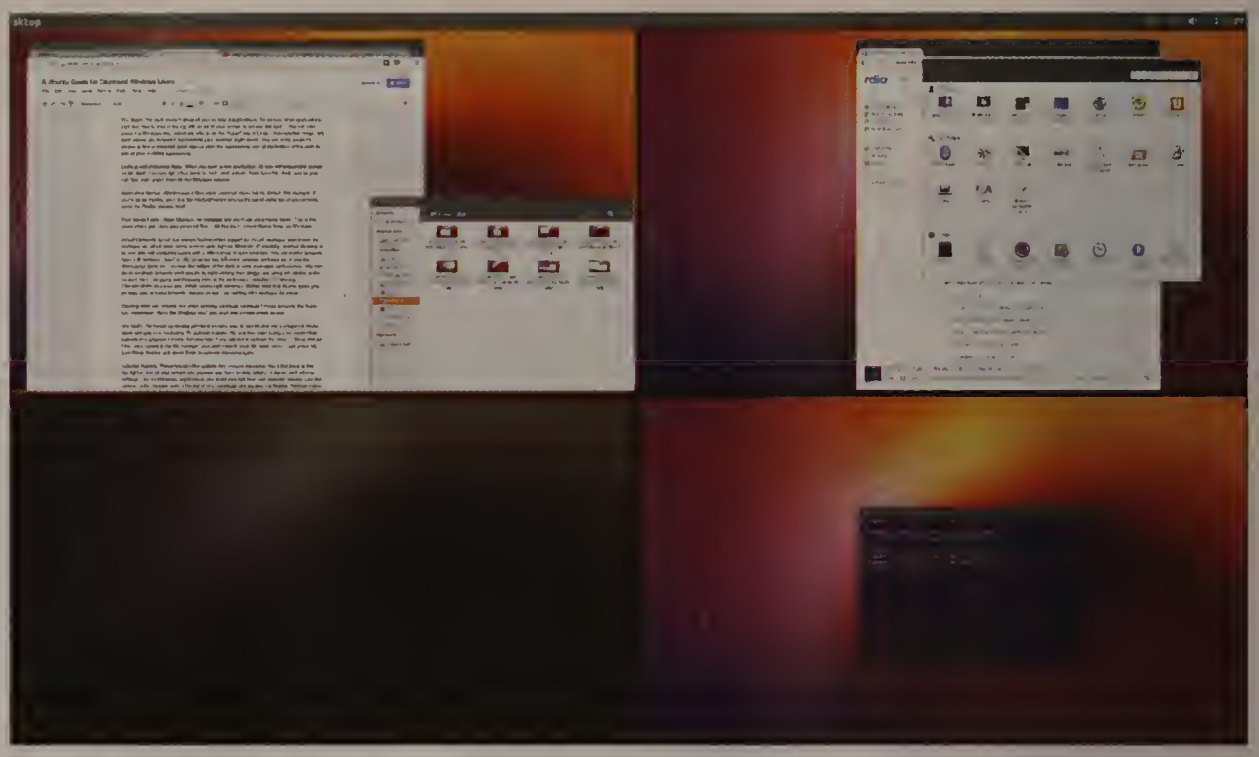
taskbar, the dock shows both running and not-running applications and has right-click jump lists (known as *quick lists*). Unlike the Windows taskbar, however, the dock can't move over to another edge of the screen.

**The Dash:** The dock doesn't show all your installed applications. To reach other programs, you open the Dash; to do that, click the *Ubuntu* icon at the upper left of your screen, or press the <Windows> key (known as the Super key in Linux). Use the Dash's search feature to find an installed application, or click the *Applications* icon at the bottom of the Dash to browse all installed applications.

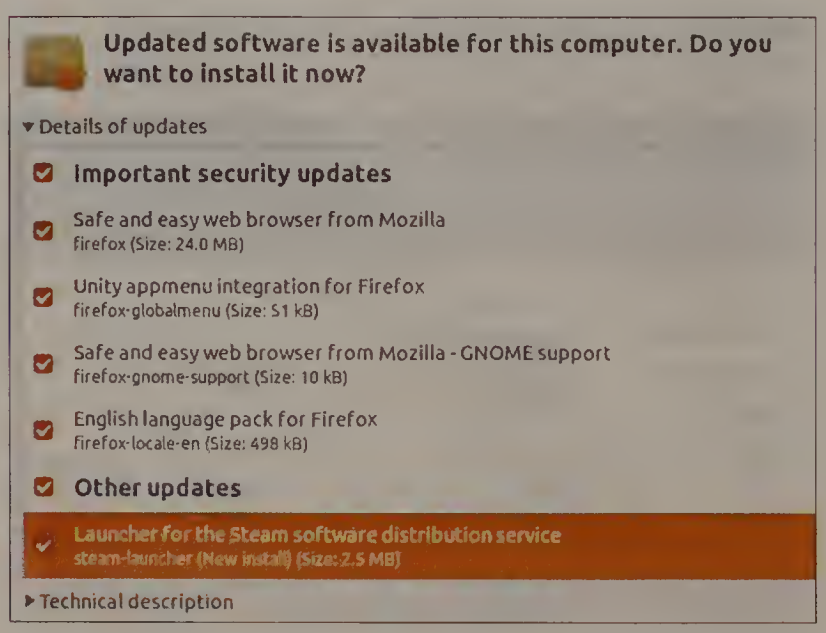
**Lock and unlock app icons:** When you open a new application, its icon will appear on the Dash for as long as it's running. You can right-click icons to lock them to, and unlock them from, the dock.

**Application menus:** Ubuntu uses a Mac-style universal menu bar by default. So if you're using Firefox, for example, you'll find the File, Edit, and View menus on the panel at the top of the screen, not in the Firefox window.

**Your Home folder:** Open Ubuntu's file manager, and you'll see your Home folder. This is where you store your personal files, just as you would in the C:\Users*Name* folder in Windows. But unlike in Windows, your user account doesn't have write access to areas in Ubuntu outside of your Home folder, so get used to storing your files here.



**The Workspace Switcher** makes you more productive by letting you view and manage workspaces.




**Ubuntu Software Updater** lets you update apps with one program.

**Workspaces:** Linux has excellent support for workspaces, also known as *virtual desktops*. A virtual desktop is a self-contained workspace with a specific set of open windows. You can switch between workspaces with hotkeys by pressing <Ctrl>-<Alt> and an arrow key.

The Workspace Switcher icon located near the bottom of the dock also lets you view and manage your workspaces. You can move windows between workspaces in any of three ways: right-click their title bars and use the options in the context menu, drag and drop them in the Workspace Switcher, or simultaneously press <Ctrl>-<Alt>-<Shift> and an arrow key.

**The HUD:** The Ubuntu head-up display (HUD) provides an easy way to search and use an application's menu items with just your keyboard. To activate the feature, press <Alt> and start typing a command that appears in a program's menu. For example, if you want to activate the *View* ▸ *Show Hidden Files* menu option in the file manager, press <Alt>, type **Show Hidden**, and press <Enter> to activate that menu option. You can also use this feature to search for and find menu options.

**Indicator applets:** Like system tray icons in Windows, indicator applets show your battery status, network connection, and sound settings. Applications can add their own indicator applets. Use the options under the gear icon to shut down your computer or to access the System Settings window.

**Desktop hotkeys:** To see more Unity keyboard shortcuts, press and hold the <Windows> (Super) key, and a cheat sheet will appear.

# How to Stress-Test Your Computer's Hardware

MODERN-DAY PCs are more reliable than ever before, but that doesn't mean the machines are infallible. Stress testing can help to identify critical faults before your system fades out in the middle of a critical operation.

Whenever you buy or build a PC, swap out a major component, or overclock a piece of hardware, it's a good idea to stress-test—or "burn in"—the fresh gear. (Note that this is not the same thing as benchmarking your rig.)

Stress-testing software places the components under an intense workload to simulate a worst-case scenario; if a component crashes, hangs, or otherwise fails a dedicated stress test, there's a good chance that it won't be reliable under a heavy everyday load. It's best to uncover unstable components sooner rather than later, while they're still under warranty.

**Stress-testing your new (or newly overclocked) PC helps you ensure its stability by pushing the machine to its limits.**

Running stress tests can also let you know if your computer needs additional cooling. If a graphics card or overclocked CPU consistently overheats and shuts down during a stress test, it's time to dump the stock cooler, add a few case fans, and possibly even consider liquid cooling.

## Lay the Groundwork

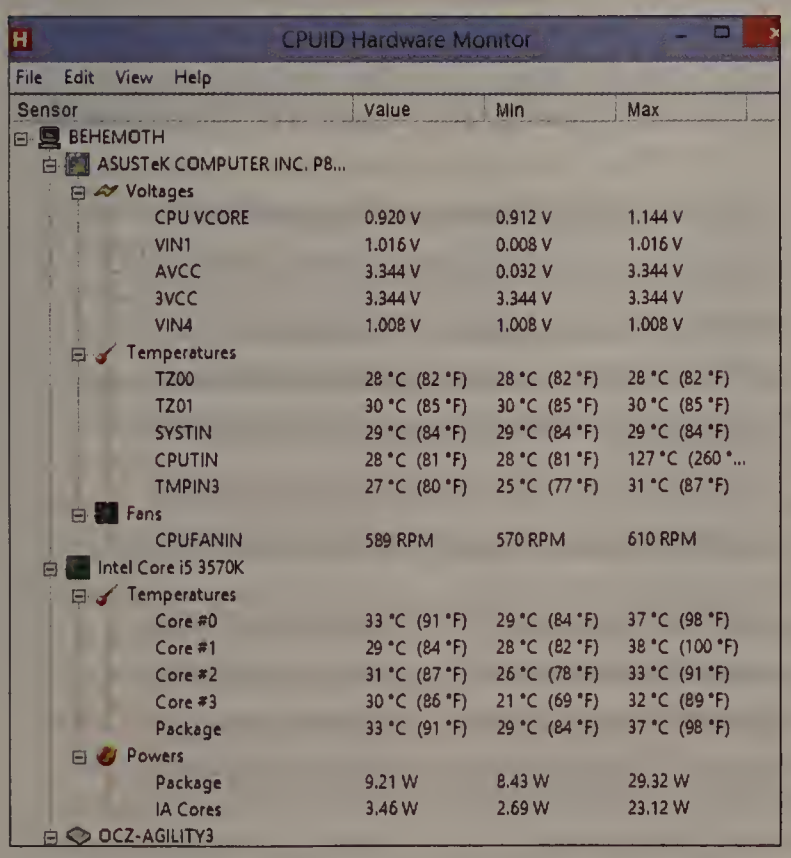
The actual process of stress testing isn't complicated, though it can be time consuming. Before you begin, you need a way to gauge the effects on your system. CPUID's HWMonitor (go.pcworld.com/hwmonitor) gives you a real-time glimpse of your components' temperatures, voltage, and fan speeds. SpeedFan (go.pcworld.com/speedfan) does the same, though its interface isn't quite as polished as HWMonitor's.

You'll want to have at least one of the two programs open during the stress tests. While many components will automatically shut down if they overheat, not all will, and you should pull the plug on the testing if any of your hardware reaches dangerous heat levels—you could fry your components in a worst-case scenario. If CPU temperatures start to creep north of 70°C, or if graphics card temperatures exceed 105°C (though that varies by model—check your vendor's site), stop the test and add more cooling to your computer. You also should halt testing if temperatures hover around those marks for an extended period of time.

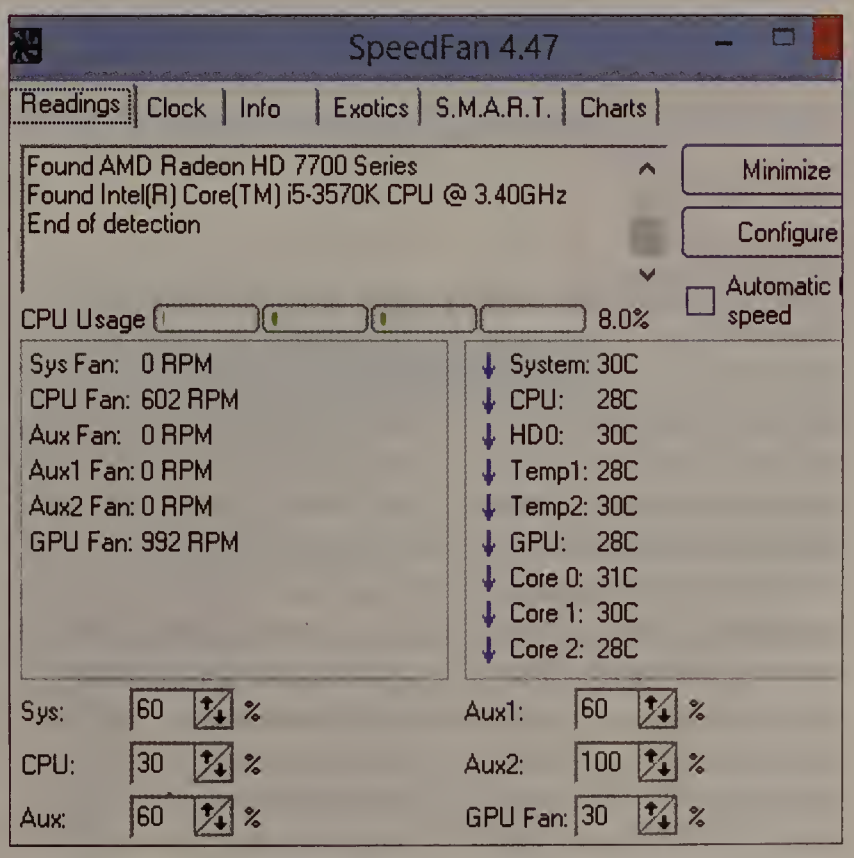
Close any nonessential programs and dive into your system's power settings to prevent it from going to sleep. You don't want your computer to doze off while you're stress-testing it. If you use a screensaver, disable that, too.

## Push Your CPU

If you stress-test just a single component, make it your CPU. The processor is that important—and it's frequently the culprit behind an unstable system. »




**HWMonitor** lets you monitor your CPU as you stress-test.



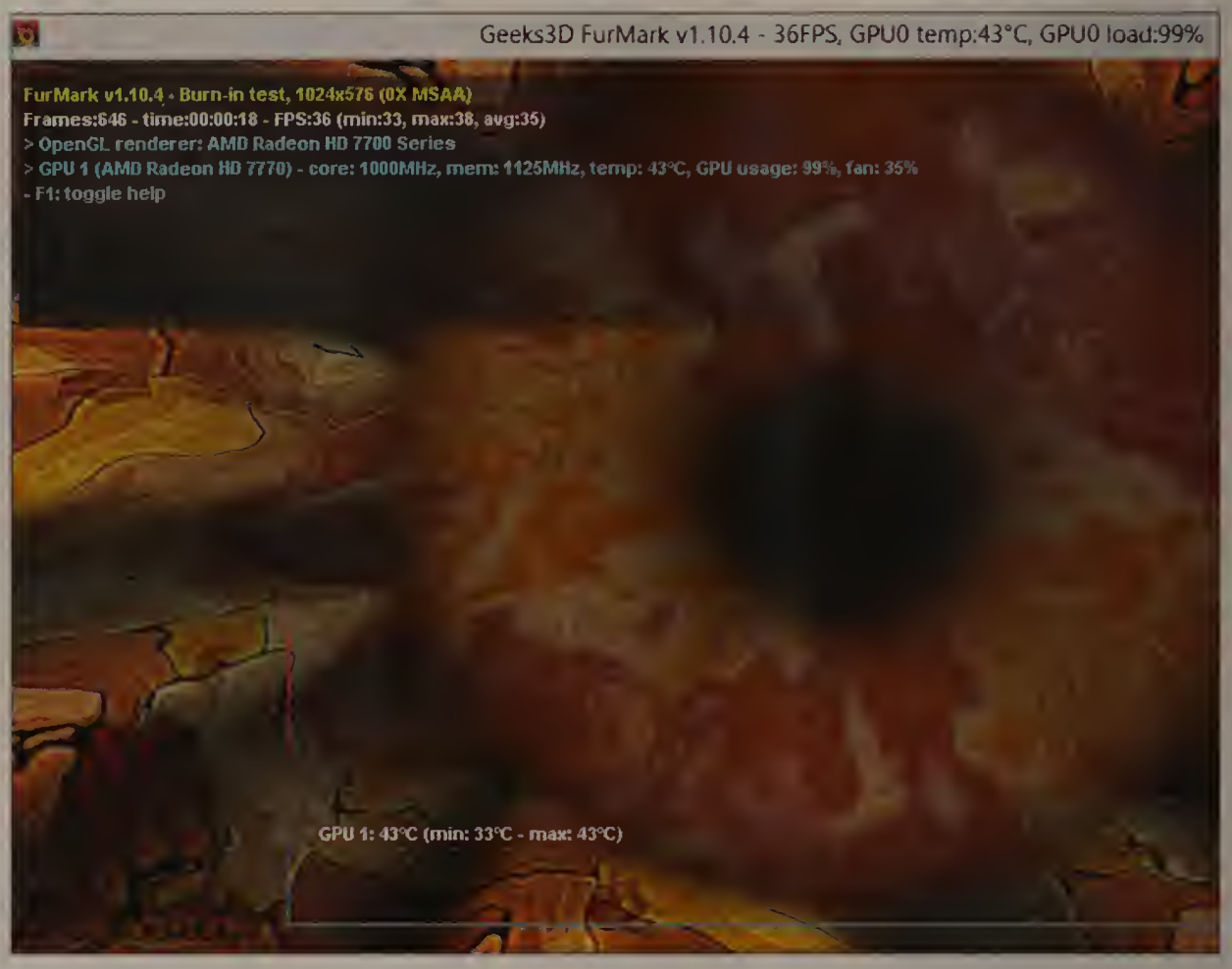

**SpeedFan** is similar to HWMonitor, but a little less attractive.

Prime95 (go.pcworld.com/prime95) has become the de facto standard for CPU stress-testing. The software hammers your processor. Launch the program, and choose *Options* ▸ *Torture Test* to bring up a list of options. Many people use the Blend test. Blend stresses both the CPU and the RAM; if no errors pop up after 4 hours or so, you can consider your CPU sufficiently stable for normal use. Alternatively, the Small FFT and Large FFT torture tests lay off the RAM a bit to subject the CPU to as much stress and heat as possible.

If you have the time, and if your PC has adequate cooling, feel free to "torture" your PC with Prime95 for much longer. The utility sometimes catches CPU errors even after half a day of testing. If your rig can run Prime95's Small FFT test for a full 24 hours without issue, the CPU is as solid as a rock and ready to fold.

Want a second opinion? Different programs test CPUs in different ways. OCCT and IntelBurnTest (go.pcworld.com/intelburntest) are two favorites of hard-core types. They each hit your processor hard and ramp up temperatures very rapidly, however, so keep a close eye on your system-monitoring software when you start them up.

No matter which testing program you choose, run it for at least 4 hours; a full overnight run is preferable. I like to stress-test new PCs using Prime95's Blend and Small FFT tests for at least 12 hours apiece.




**No, that's not** the eye of Sauron, it's the FurMark stress test giving your video card a workout.

## Ramp Up Your RAM

When it comes to seriously testing RAM, only one option is worth considering: Memtest86+ (go.pcworld.com/memtest86). Simply burn the application to a flash drive or CD, insert it into your PC, and then boot your computer to the media type you're using. Once it's up and running, let the software do its thing for a long time—preferably overnight. The goal is to have zero errors. If you do get an error, you'll have to retest each RAM module individually.

## Test Your Video Card

If you're into games, stress-testing your graphics card is a no-brainer, especially since graphics cards tend to fail under heavier loads—such as when you're playing top-end games. Another bonus: Graphics torture tests usually coax underpowered or faulty power supplies into giving up the ghost, so you're stressing two birds with one stone.

Benchmarking tools abound, but FurMark (go.pcworld.com/furmark) was designed to give your GPU a real workout, and it punishes graphics cards much harder than the average game does. This bad boy uses real-time renderings of undulating furry objects to test your graphics card's limits, complete with antialiasing and resolution options. Stick to the standard burn-in test, but keep an eye on HWMonitor and/or SpeedFan—FurMark gets your GPU very hot, very quickly. You won't need to run FurMark for long. If your graphics card is going to crash or start tossing out funky visual artifacts, it will do so within 15 to 30 minutes.

Once the GPU passes its primary stress test, I like to run some benchmarks derived from actual games to see how the graphics card holds under real-life usage. My favorite software for doing that is the Alien vs. Predator and S.T.A.L.K.E.R benchmarking tools, both of which are freely available.

## What About the Rest?

The CPU, GPU, and RAM are the only major system components you really need to worry about stress-testing. You can optionally test your storage drives or your laptop's battery life, but such exercises are more benchmark tests than stress tests.—*Brad Chacos*

## ANSWER LINE

# Manage Passwords, on the Web and in Applications

**?** Is there a program that keeps track of passwords online and in apps? *—Mgentry2*

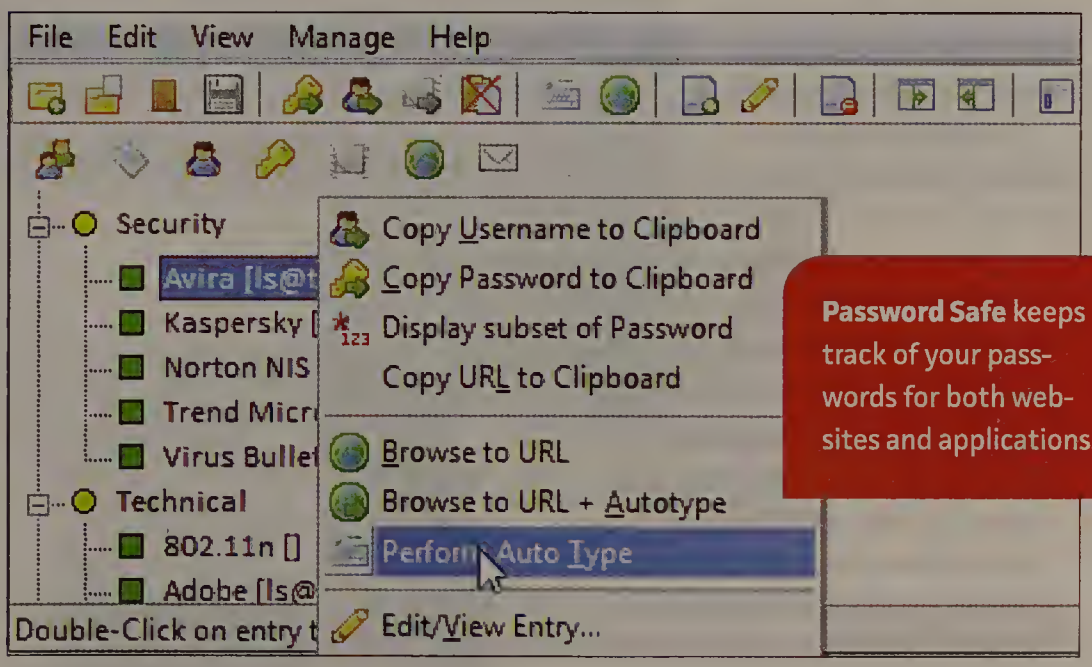
LINCOLN SPECTOR

**THE SAFEST PASSWORDS** are long, seemingly random strings of letters, numbers, and punctuation marks—and you need a different one for each site you log in to and each application that requires it. Unless you have a photographic memory, you need a program where you can securely store your passwords. That way, you simply need to remember the one password that will give you access to all the others.

You need a password manager, which is essentially an encrypted password database. A good password manager should work for both websites and applications. I use Password Safe (go.pcworld.com/passwordsafe). It's free, open source, and available on multiple platforms. I run it on my PC, Android phone, and iPad.

Password Safe doesn't directly integrate with your browser, but it's reasonably browser-friendly. When you're at a site's log-on page, open Password Safe, right-click the appropriate item, and select *Perform Auto Type*. To enter a password into an application, simply double-click the corresponding item in Password Safe. This action puts the password in your clipboard; from there you can easily paste it into the application. Password Safe clears the clipboard within a few minutes, or when you close it.

KeePass (go.pcworld.com/keepass) is another free password manager. Many people find it easier to use than Password Safe. You may want to try both before you commit to one.




**Password Safe** keeps track of your passwords for both websites and applications.

## Back Up Your Entire Drive: Cloning vs. Imaging

Both cloning and imaging create an exact record of your drive or partition—not just the files, but also the master boot record, the allocation table, and everything else required to boot and run your operating system.

You needn't back up your whole drive to protect your data—a simple file backup will handle that job. But if your hard drive crashes or Windows becomes hopelessly corrupt, a clone or image backup can save the day.

When you *clone* a drive, you copy everything on it onto another drive, so that the two are effectively identical. Normally, you'd clone to an internal drive made external via a USB-to-SATA adapter (see page 93) or enclosure.

But *imaging* a drive is like creating a great big .zip file (without the .zip extension). Everything on the drive is copied into a single, compressed, but still very large file. You then save the image on an external hard drive.

So what are the advantages of each method? The advantage of a clone is that if your primary hard drive crashes, the clone will get you up and running quickly—all you have to do is swap the drives. If you had backed up the drive to an image, you'd have to buy and install a new internal hard drive, boot from your backup program's emergency boot disc, and restore the drive's contents from the backup.

An image backup has its advantages, however. You can save several images onto one sufficiently large external hard drive, making it easier and more economical to save multiple versions of the same disk or to back up multiple PCs.

You can find several programs that handle these chores, including the backup tools in Windows 7 and 8. But I recommend Macrium Reflect Free (go.pcworld.com/macrium), which is free for personal use. It's easy to use, very reliable, and capable of both cloning and imaging.

PHOTOGRAPH: ROBERT CARDIN

# Monitor a Laptop's Drive Activity via a Virtual LED

CALL ME OLD-FASHIONED, but I like to know when my hard drive is active.

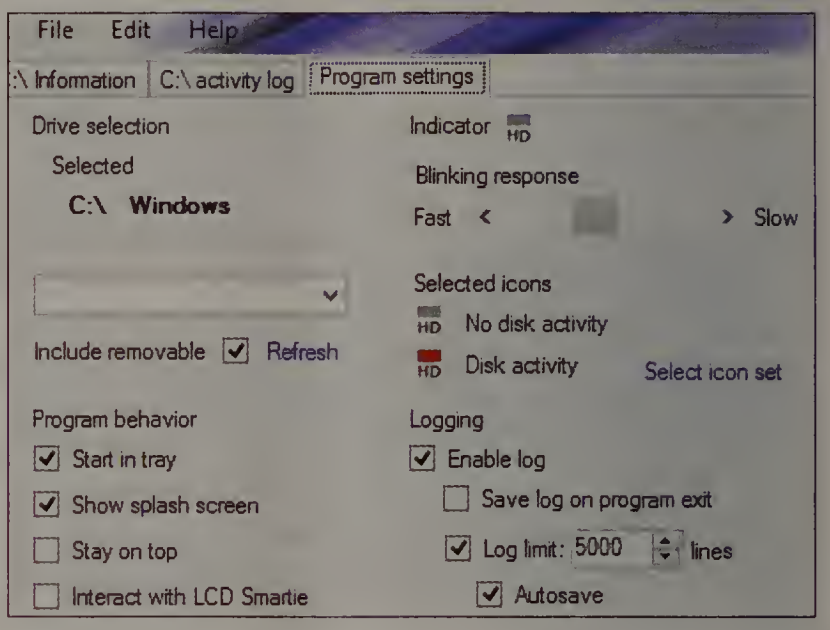
That's partly so I know when Windows finishes booting, and partly so I can troubleshoot.

In the old days, I could hear a drive thrashing inside my desktop PC. But now that I work mostly on laptops, which incorporate much quieter drives (or, in the case of solid-state drives, silent drives), I have to rely on LEDs. Just one problem: Like many newer laptops, my Samsung Series 9 Ultrabook has no LED at all.

Happily, I found Activity Indicator (donation requested; go.pcworld.com/actindicator). This utility adds a drive-activity "LED" to Windows' system tray so that you can keep tabs on a drive's read/write status.

Activity Indicator not only provides basic drive info (total space, space consumed, and so on), but it can also save a customizable log of all disk activity. In fact, you can review that log right inside the program's settings window, saving it to a file only when you need to.

You can choose from 18 icon sets to show drive activity and inactivity—from an LED-like rectangle to a Geiger counter–style meter. You can even configure the "LED" to interact with actual keyboard LEDs (if your system has them), lighting up, say, the <Num Lock> key whenever the drive is active. When I tried to do so on my Samsung, however, pairing it with the <Caps Lock> key, it triggered the actual Caps Lock function every time the drive jumped into action. (I had to disable that option, natch.)




**Activity Indicator** lets you keep an eye on your hard disk's activities.

To make the most of Activity Indicator, you need to do two things. First, modify your system tray so that the indicator stays visible at all times. (Set it to *Show icon and notifications*.) Second, because the utility lacks a "run at startup" option, you must either load it manually each time you start Windows or add it to your Startup folder.

Even with that minor annoyance, however, Activity Indicator is a very useful little problem solver.—*Rick Broida*

## EASY HACK: FIVE WAYS TO COPE WITH FLAKY HOTEL WI-FI

**I RECENTLY STAYED at a hotel that offered free Wi-Fi, but the network was terrible. In such situations, I try one or more of the following fixes.**

**1. Ask the front desk to reset the router:** If you can't get or stay connected, it might just be a router issue. Call the front desk and ask them to reset the hotel router. Then wait 5 minutes to connect again.

**2. Check for an ethernet option:** Some hotel rooms have an ethernet port or cord that will let your laptop bypass Wi-Fi and jack into the network. If you need to share that connection with, say, your tablet, try the free Connectify Hotspot software router (connectify.me). Alternatively, you can carry a travel router such as the TP-Link TL-WR702N (tp-link.com).

**Virgin Mobile's** affordable MiFi hotspot.

**3. Try the lobby:** Your room may be too far from the nearest Wi-Fi repeater. Move to a conference room or the lobby.

**4. Pack a pay-as-you-go hotspot:** A mobile hotspot gives you Internet access anytime, anywhere. To avoid getting stuck with a large carrier's contract and fees, try a pay-as-you-go hotspot. DataJack (datajack.com), TruConnect (truconnect.com), and Virgin Mobile (virginmobileusa.com) offer no-contract MiFi hotspots for under $100, with affordable pay-as-you-go data plans.

**5. Use your phone's hotspot feature:** Most Android phones and the latest iPhones have a mobile-hotspot (aka *tethering*) feature. Ask your carrier what options are available on your phone, and how much they might add to your monthly bill.—*Rick Broida*

## HASSLE-FREE PC

# Use SpeedTest to Help Diagnose Internet Problems

Plus: Try a fun 'Star Wars' RSS reader, and add a USB-to-SATA adapter to your toolkit.

RICK BROIDA

**I RECENTLY TRIED** to pinpoint a problem with my Internet connection.

Usually I blame my ISP, Comcast, for connection problems, but Comcast outages tend to be a total interruption of service. This time, however, the problem was intermittent. Sometimes my connection would slow to a crawl, and on other occasions it would disappear altogether for a few minutes.

Time for some detective work. I used the free SpeedTest (speedtest.net) service to test the speed of my Internet connection. First, I ran it on my Samsung laptop. Sure enough, my usually speedy Comcast connection was dragging its feet: Download performance ranged from 2 to 8 megabits per second; I normally see at least 30 mbps.

But that alone didn't tell me whether the cause lay with Comcast, my router, my laptop, or something else. I then ran SpeedTest on my iPhone, which at home connects to the same Wi-Fi net. (SpeedTest offers free mobile apps for Android and iOS.) The iPhone blazed through the test. So the problem was with my laptop. Now I could focus on other possible culprits.

**SpeedTest** gauges the speed of your Internet connection.

As it turned out, my issue was due to a combination of Wi-Fi drivers and a Samsung-specific Google Chrome bug—but that's a hassle story for another day.

## Turn an RSS Feed Into a 'Star Wars' Crawl

Many users still rely on RSS feeds for reading the latest posts on their favorite sites. Now that Google is pulling the plug on Reader, the door is wide open for interesting alternatives, and StarRSS is one. It turns any RSS feed into scrolling text, complete with music from a certain sci-fi classic.

Just head to the StarRSS page (go.pcworld.com/starrss) and paste in the address for your favorite feed. The text crawl isn't merely ornamental; you can click any headline to open that post in a new tab. Alas, there's no way to pause or reverse the crawl.

Ultimately, StarRSS is just a cute little diversion that you probably wouldn't use on a regular basis, but it's definitely fun to show to friends and coworkers.

If nothing else, I hope it makes you smile.

## Get a USB-to-SATA Adapter

A couple of years back, I called the USB-to-IDE/SATA adapter the most indispensable tool in my PC repair kit. Recently, it once again proved itself worthy of that title.

In a nutshell, such an adapter allows you to connect an internal hard drive to your PC, externally. What would an internal drive be doing *outside* of your system? Funny you should ask.

My media-center PC's hard drive recently failed. In short order, the machine wouldn't boot. I had to replace the drive, reinstall Windows, and so on. But I wanted to salvage my recorded TV shows. So I connected the old, non-booting drive (now outside the PC) to a USB port via my adapter. Success! The machine read the drive and copied over the recordings.

Another reason to keep one of these adapters on hand is if you plan to upgrade to a solid-state drive. Unless you buy a kit that comes with an adapter, you'll need one so that you can clone your existing drive over to the new SSD. Then you can remove the old drive and install the new one.

These days, unless you have a fairly old desktop or laptop, you can skip buying a USB-to-IDE/SATA adapter and just go for a USB-to-SATA model. I recommend one that supports USB 3.0. You may not need it now, but your next PC will likely have USB 3.0 ports, and copying files between drives via the adapter will be much faster.

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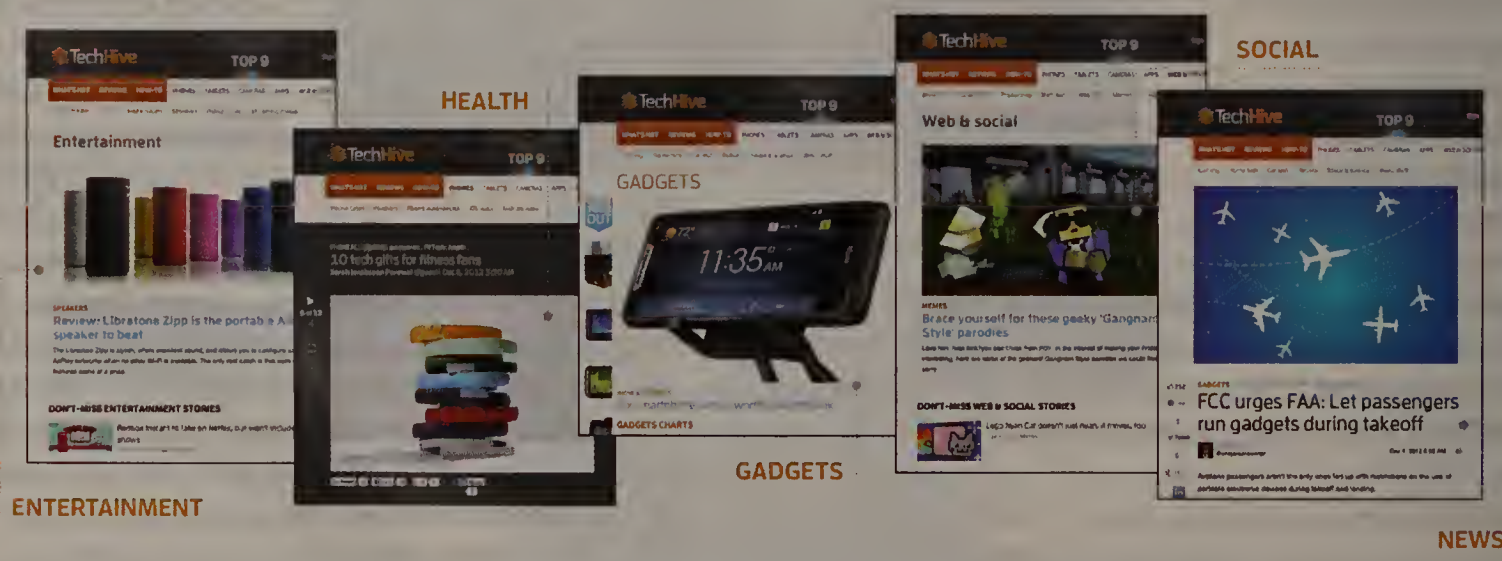
News, tips, and reviews about phones, tablets, apps, and all the other tech in your life.

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## ADVERTISER'S INDEX


| ADVERTISER | PAGE # |
|---|---|
| 1&1 Internet Inc. | 8 |
| APC | 17 |
| Carbonite | 22 |
| Citrix Systems | C2 |
| CyberPower Inc. | 3 |
| gDoc | 11 |
| Global BizForce | 47 |
| I.R.I.S. | 12 |
| IBM | C4 |
| iBUYPOWER | 75 |
| OCZ Technology | C3 |
| RockAuto, LLC | 46 |
| Samsung | 5 |
| Stand Up to Cancer | 76 |
| The Teaching Company | 30 |
| TP-LINK USA | 26 |
| VersaCheck.com | 10 |
| Zalman | 6 |

# Five Things

**YOU MUST KNOW ABOUT...**

## Xbox One

Microsoft's upcoming console is designed to be all things to all audiences. It will play the latest games, but it will also link to your streaming media accounts, your cable box, and your tablet—via the SmartGlass app—in a bid to rule your living room.

### 1

**Live-TV Integration**

If you hook your cable box into your Xbox One via its HDMI-in port, you can switch to live TV simply by pressing a button—or by saying "Xbox, live TV" loud enough for the Kinect microphone to recognize the command. The console also features an "Xbox One Guide" that outlines currently available broadcast-TV programming alongside on-demand content. You'll be able to organize media content by your "favorites," as well as by the degree to which it is currently trending in popularity.

### 2

**Terrifying Power**

Driven by an eight-core processor and 8GB of RAM, the Xbox One will have USB 3.0 ports, a Blu-ray drive, a 500GB hard drive, and Wi-Fi. Every unit comes with a new Kinect, a 250,000-pixel infrared tracking camera that can process 2GB of data per second. It can distinguish your thumb from your hand and register wrist and shoulder rotations. According to Microsoft's Mark Whitten, it can "read your heartbeat" by measuring tiny changes in skin tone as the blood vessels in your face expand and contract.

### 3

**Multitasking**

Borrowing a trick from Windows 8, the Xbox One's Snap Mode lets you multitask between apps and functions on the same screen. If, say, you're watching a sporting event, you can prompt the Xbox One via voice command or button press to access your updated fantasy league stats or to search the Web with Internet Explorer. The Xbox One also includes Skype integration and allows video chats over Xbox Live, through Kinect. In effect, the Xbox One can turn any TV into a smart TV.

### 4

**No Old Games**

Some great new games are in the pipeline for the Xbox One (see page 18), but the console is not backward compatible. You can't play Xbox 360 games on it, and you can't use your old controllers. You can, however, bring your Xbox Live Gamertag and your Xbox Live Gamerscore over to the new console. The migration may include digital movies and music you've bought on Xbox Live, but it does not include downloadable Xbox 360 Arcade games, which won't work on the Xbox One.

### 5

**It's Always Watching**

The console works sort of like a video game DVR, constantly buffering gameplay footage onto the hard drive so that you can say "Xbox, capture that" and save a clip of your latest exploits for posterity. You can share the clips via Xbox Live, YouTube, and other social networks. Kinect is always watching, too: It must be connected to the Xbox One for the console to function, and it has a low-power mode that enables it to listen for voice commands even when the Xbox One is switched off. ●

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